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ALBUMINATE OF IRON.

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Among the ferric compounds introduced during the past few years, albuminate of iron has attracted some attention abroad, but has been noticed only to a limited extent in the United States, if I may be allowed to judge by the demand for it in this locality. Recently, however, I was called upon to prepare a solution of albuminate of iron by a formula suggested by Dr. W. Dönitz, of Tokio, Japan. This formula differed so radically from those that had previously come under my observation, both in the manipulation directed and the proportion of ferric chloride and egg albumen employed, that I was led to make some comparisons, and eventually a series of experiments, during the course of which some facts were developed that seem to merit publication. But before giving these experiments in detail a brief review of the methods and experiments that have been made public, or as far as they have come under my observation, is necessary; and it is also necessary to explain that, in so far as the method of Dr. H. Hager is concerned, which anticipates me in the application of common salt to the precipitation of the ferric compound, but differs widely in some particulars, I had no knowledge of it at the time my method was developed.

*Friese*¹ first recommended albuminate of iron for the treatment of chlorosis, rhachitis, etc. He obtained it by adding 10 grams of liq. ferri sesquichlor., *Phar. Ger.*, to the white of one egg; washing the precipitate with distilled water until the excess of ferric chloride was removed, then macerating the residue for 24 hours in 500 cc. of distilled water and 12 drops of hydrochloric acid to effect solution. The albuminate of iron so produced is said to contain 2·8 per cent. iron.

*Kobligk*² observed that an albuminate containing uniformly as much iron as stated by *Friese* cannot be obtained. Also, that the albuminate

¹"Berlin. Klin. Wochenschr.," 1877; "Phar. Centralh.," Aug. 2, 1877, p. 251.

²"Schweiz. Wochenschr. f. Phar.," 1877, No. 47, p. 381.

is somewhat soluble in water, and that therefore it should not be mixed with large quantities of that fluid, but should be washed upon a filter as long as the water passes clear:

*Bernbeck*¹ makes the same observation as *Kobligk* regarding the solubility of the albuminate produced by *Friese's* method, but ascribes the solubility to the excess of hydrochloric acid in the officinal (Phar. Ger.) solution of ferric chloride. He recommends that 6 parts of dry ferric chloride, obtained by evaporating the officinal (Phar. Ger.) liquor, be dissolved in 10 parts of distilled water, the solution filtered and mixed intimately with 20 parts of albumen; the brown-yellow magma is transferred to a wetted cloth, expressed with the hands, and this is repeated with the addition of distilled water until the excess of ferric chloride is removed. The residue is then dissolved by macerating it for one or two days in half a liter of water containing 12 drops of muriatic acid. By parts, the author evidently means grams; by albumen, the white of eggs.

*Biel*² recommends the following method: 10 grams of dry egg albumen are dissolved in 100 grams distilled water, clarified by subsidence, and mixed with 3.2 gram liq. ferr. chlor. of 30 per cent. (or 2.4 grams Phar. Ger.), previously diluted with 10 times the quantity of water; the mixture is gently heated and agitated vigorously, after which 20 grams of 90 per cent. alcohol and sufficient water are added to make the mixture weigh 200 grams. When used, the concentrated liquor is to be diluted with four times its weight of water, and then contains 0.033 per cent. iron. By subjecting the solution to dialysis, a neutral product was obtained, but it still contained chlorine, and appeared to possess no advantage over the normal solution. Dry albuminate of iron is obtained by evaporating the solution to syrup, spreading this on glass plates, and drying at 40°C. (=104°F.) The golden-yellow lamellæ contain 3.34 per cent. iron, and readily dissolve in warm water after the addition of 1 or 2 drops of hydrochloric acid (to how much of the albuminate?).

*Holdermann*³ records some experiments relative to the conditions which favor the precipitation of the albuminates, the influence of acidity, alkalinity, etc. The nature of the acid in the ferric salt employed appears to exercise a decided influence on the composition (proportion

¹"Arch. d. Phar.," 1877, Dec., p. 521.

²"Phar. Zeitschr. f. Russ.," 1878, No. 7, p. 193.

³"Arch. der Pharm.," Feb., 1878, p. 149.

of iron) of the albuminate, but the latter, after its formation, does not appear to become changed in its composition by fractional washings.

*Merck*¹ recommends the method of Dr. Hoffmann(?) for preparing dry albuminate of iron. Fifteen parts crystallized ferric chloride (containing 20 per cent. Fe), or 20 parts liquor ferr. sesquichlor. (Phar. Ger.), are dried with 10 parts dextrin at 40° to 50°C. (=104° to 122° F.), and pulverized; then 80 parts pulverized egg-albumen are mixed with it. He describes it to form lustrous brownish-red crystals (?), not hygroscopic, soluble in 50 parts cold water, and most readily at a temperature of 30° to 35°C. (=86° to 95°F.). A slight deposit may form on standing, which is readily dissolved by a few drops of hydrochloric acid.

*Dünitz*² gives the following formula: The white of one or two eggs is thoroughly mixed with about 150 cc. water, and a solution of six drops of officinal (Phar. Ger.?) solution of ferric chloride in 30 cc. water is gradually added, agitating vigorously after each addition. The turbidity at first produced gradually disappears on the further addition of the ferric solution, but the addition of a few drops of hydrochloric acid may be necessary if the ferric solution has been added too rapidly. The solution is finally filtered, which it does more easily than if it is attempted to filter the solution of albumen before the addition of ferric chloride. Upon evaporating the solution at a moderate temperature a permanent and readily soluble dry albuminate is obtained. Finally,

Hager, in an Appendix (p. 1338) to his recently-completed "Handbuch der Pharmaceutischen Praxis," gives the following formula for "ferrum albuminatum saccharatum": 100 cc. albumen (from 5 hen's eggs) are vigorously shaken with 400 cc. water, the solution is strained without expression, mixed with 250 cc. of a cold saturated solution of common salt, and then with 40 cc. liq. ferri sesquichlor. (Phar. Ger.) diluted with 160 cc. water. After about half a day, the mixture is diluted with 3 liters of water, well shaken, the precipitate collected upon a muslin strainer, washed with water, etc. The well-drained magma, which when dry amounts to about 10 grams, is mixed with 60 grams of powdered refined sugar, dried at the temperature of the water-bath on porcelain plates, weighed, powdered, and mixed with sufficient sugar to make 100 grams of saccharate. This contains 0.65 to 0.66 per cent. ferric oxide; the pure albuminate 6.5 to 6.6 ferric

¹"Phar. Zeit.," March, 1878.

²"Berlin. Klin. Wochenschr.," Sept. 8, 1879, p 535.

oxide. The same preparation may be obtained by precipitating the solution of the albuminate of iron with alcohol, etc.

As mentioned, my first practical acquaintance with albuminate of iron was with the solution produced by the formula of Dr. Dönitz. This solution is, as described by the author, a perfectly transparent light-brown liquid, nearly tasteless, and will keep well in cool weather for several weeks. It contains, as I have determined by calculation and subsequent experiments, an excess of albumen, even when the smaller quantity of egg-white is employed, for which reason the latter quantity was adopted for the experiments made with this¹ solution. When such a solution is evaporated in a current of warm air a light-brown, transparent residue is obtained, which may be detached in the form of scales, and readily furnishes a powder having a very light cinnamon-brown color. This *dry* albuminate also corresponds] to the description of Dr. Dönitz, being readily dissolved by water to form a clear solution, particularly if a modicum of dilute hydrochloric acid is added. The yield, however, is necessarily very small, owing to the dilute character of the solution;¹ and the preparation of dry albuminate from such, on any considerable scale, is therefore out of question; and though subsequent experiments showed that a far more concentrated solution of albuminate of iron could be obtained by a modification of the method, it nevertheless seemed desirable to ascertain some process—if possible one of precipitation—whereby the evaporation and consequent exposure of any considerable proportion of liquid should be avoided. To this end, it became necessary to subject the known or accepted characters of albumen and its compounds to critical review, when, among others, the following points bearing directly upon the subject under consideration were developed.²

1. Albumen is not precipitated from its aqueous solutions by ferric chloride,³ and even prevents the precipitation of the oxide of that metal by alkalis.

¹ Egg-white contains about 12.5 per cent. dry albumen (which quantity has been accepted by me in my experiments), consequently six fluidounces of Dönitz's solution will yield only about one drachm of albuminate.

² The principal works consulted were "Graham-Otto's Lehrbuch der Chemie," "Organische Chemie," vol. iii, by H. v. Fehling, and "Dictionary of Solubilities of Chemical Substances," by Frank A. Storer.

³ This does not, however, apply to the egg-white in its natural condition, as is evident from the methods hitherto pursued for the preparation of albuminate of iron.

2. Albumen is precipitated from its aqueous solutions by dilute sulphuric, nitric, hydrochloric and pyro- and meta-phosphoric acids; but by the ordinary tribasic phosphoric acid, or by organic acids, only upon the addition of chloride or sulphate of sodium, or other alkali salts.

3. Albumen appears to form *acid* and *normal* salts, the first containing one molecule of base, the second two molecules. It also appears to combine directly with some salts—principally basic—in the same proportions.

4. The *acid* salts of albumen are sometimes soluble, the *normal* salts generally insoluble in water; but neither are insoluble in excess of metallic salt or albumen.

5. The formula for albumen is, according to Lieverhühn, $C_{144}H_{122}N_{18}S_2O_{44}$ ¹, and is so generally accepted. That of its *acid* salts would be represented by the formula $MO, C_{144}H_{122}N_{18}S_2O_{44}$, and that of its *normal* salts by $2MO, C_{144}H_{122}N_{18}S_2O_{44}$.

It becomes evident, from the above, that my inquiries gave no clue to a precipitate for albuminate of iron, and it was therefore by a purely empirical process of reasoning that I decided to try the effect of a saturated solution of common salt upon a quantity of Dönitz's solution of albuminate of iron, to which an excess of ferric chloride had been previously added. The result was an immediate, copious and evidently complete precipitate, which my experiments seem to prove to be an albuminate of definite composition, and which is obtainable from solutions containing an excess of albumen as well as from such that contain an excess of ferric chloride. The following is a brief account of the experiments made:

1. To a quantity of Dönitz's solution corresponding to one egg-white, one fluidrachm liq. ferri chlor., U. S. P., diluted with water and partly neutralized with ammonia, was added, whereby no other change than a slight deepening in color was produced. On now adding a quantity of saturated solution of chloride of sodium (hereafter designated as "solution of salt"), a copious, light brown precipitate was produced, while the supernatant fluid had a decided yellow color, gave abundant evidence of iron, and only faint evidence of albumen. The precipitate was collected, expressed, shaken with distilled water, in which it dissolved completely, and again precipitated with solution of salt. The filtrate now passed colorless, and gave only faint evidence

¹ The old notation is retained in this paper.

of iron and of albumen. The strongly expressed precipitate constituted a translucent mass, light brown in thin, dark reddish-brown in thick layers, very friable when dry, and then easily reduced to a very fine powder having a light cinnamon-brown color. It was readily soluble in water. Its quantity was not determined.

2. A quantity of Dönitz's solution corresponding to one egg-white (one ounce, more or less) yielded, upon evaporation in a current of warm air, 56 grains of albuminate of iron in the form of friable, light yellowish-brown, translucent scales, which produced a very light cinnamon-brown powder.

3. A portion of the same solution, corresponding to the same quantity of egg-white, was treated with one-third its volume of solution of salt, the precipitate collected, washed with a mixture of one volume of solution of salt and three volumes of distilled water (hereafter designated "dilute solution of salt"), subjected to powerful expression and dried. It weighed 34 grains and possessed all the characters of the albuminate of iron obtained by Exp. 1. The filtrate from the precipitate, however, gave but faint evidence of iron and abundant evidence of albumen, the washing being continued as long as decided evidence of the latter was given. Both the filtrate and washings appeared colorless.

From these experiments it became evident that, while in Exp. 1 a very decided excess of ferric chloride had been used, in Exp. 2 and 3 albumen was in excess. This excess of albumen is represented in the dry albuminate obtained by Exp. 2, but is removed by washing in Exp. 3, just as the excess of ferric chloride is removed by washing in Exp. 1. The quantity of ferric chloride employed in Exp. 1 was therefore reduced, some attempt being also made to establish a working formula.

4. 10 troyounces of egg-white were diluted to 20 fluidounces with distilled water, a solution of 3 fluidrachms of liq. ferri chlor., U. S. P., in 10 fluidounces of distilled water was added, and the solution filtered. 10 fluidounces of solution of salt were now added, the precipitate collected on wetted muslin, washed with dilute solution of salt, drained, expressed powerfully, and dried. The product weighed 9 drachms (= 11.25 per cent. of the egg-white employed) and had all the characters of the albuminate obtained by Exp. 1. The filtrate was yellow, though much lighter than that obtained by Exp. 1; the washings finally gave evidence only of traces of iron and of albumen. The press cake, though obtained by powerful pressure, was translucent dark reddish-

brown only in the centre, the margins, upon which the pressure was evidently not so strong, being opaque and light brownish.

5. One troyounce of egg-white was treated precisely as in Exp. 4, but instead of precipitating the albuminate, the solution was evaporated to dryness. It yielded 60 grains (=12.5 per cent. of the egg-white employed) of dry substance in the form of dirty dark-brownish scales, having a greenish tinge, and when powdered had a light brownish-grey color, very distinct from that of the products previously obtained.

6. Experiments 4 and 5 having convinced me that the quantity of ferric chloride used was still in excess, a series of experiments were made, which are not necessarily given in detail, but which consisted in adding variable proportions of ferric chloride to solution of egg-white, precipitating the solutions, and selecting from among the proportions so determined that in which there was evidence of a decided but small excess of ferric chloride in the filtrate. This was found to be 50 minims of liq. ferri chlor., U. S. P., to 4 troyounces of egg-white, and operating with these proportions at different times, the following yields of albuminate of iron were obtained, all of which corresponded in their physical characters, solubilities, etc., with the albuminate obtained by the first experiment :

4 troyounces	egg-white	yielded	214 grs.	=	11.23	per cent.	albuminate.
12	"	"	"	720	"	=	12.50
22	"	"	"	1312	"	=	12.42

With the above proportions the filtrate still had a faint yellow color and gave a decided ferric reaction, but only a faint reaction for albumen, while, when completely washed with dilute solution of salt, the final washings failed to give any appreciable evidence of either.

Assuming now, for the purpose of comparison, that albuminate of iron is a definite compound in which 1 molecule of ferric chloride (Fe_2Cl_3) is united with 1 molecule of albumen ($\text{C}_{144}\text{H}_{122}\text{N}_{18}\text{S}_2\text{O}_{44}$),¹ the following table will show the relation of the former to the latter in the different processes that have been suggested.

¹ A normal salt would require 2 molecules Fe_2O_3 to 3 molecules albumen.

Process.	Liq. Ferri Chlor.		Natural Egg-white (taken to contain 12 5 p. c. dry albumen.	Dry Egg-albu- men	Excess of dry egg-al- bumen di- rected.	Excess of Liq. Ferri Chlor., U. S. P., directed.
	U. S. Ph. sp. gr. 1.355 =12.8 p. c. Fe	Phar. Ger. sp. gr. 1.480 =15 p. c. Fe				
	Gram.	Gram.	Grams.	Grams.	Grams.	Gram.
Theory,	1.0	0.854		3.669		
Friese's,	1.0	0.854	2.628	0.341		0.907
Bernbeck's,	1.0	0.854	2.800	0.350		0.9047
Biel's,	1.0	0.854		3.570		0.0272
Merck's,	1.0	0.854		3.410		0.0908
Dönitz's, <i>a</i> ,	1.0	0.854	40.960	5.120	1.451	
Dönitz's, <i>b</i> ,	1.0	0.854	82.000	10.250	6.581	
Hager's,	1.0	0.854	1.640	0.205		0.9442
Diehl's,	1.0	0.854	29.030	3.629		0.0111

An examination of the table will make it clear that in Friese, Bernbeck's and Hager's process the quantity of ferric chloride is largely in excess of that required to form an albuminate; that Dönitz directs a considerable excess of albumen when the smaller quantity (*a*) of the latter is employed, and a very large excess when the larger quantity (*b*) is used; while Biel and Merck, whose processes are based upon the direct combination of ferric chloride and albumen, direct proportions that agree well with that theoretically required. The quantity used by me corresponds still more closely with that required by the formula provisionally accepted, and the proportion having been arrived at experimentally, before any calculation of the required quantity was made, seems to support the view that in the formation of albuminate of iron 1 molecule of ferric chloride and 1 molecule of albumen are concerned. The large excess of ferric chloride used by Hager is, as has been shown, unnecessary, and was probably adopted by him without proper reflection. That employed by Friese and Bernbeck, however, seems to have been arrived at by practical observation, and, inasmuch as I had failed to obtain precipitates by the direct action of solution of ferric chloride upon egg-white, if the latter was at all diluted with water, the following experiments were made to throw some light upon this subject, as well as upon some points embraced in the foregoing.

7. To 204 grains of egg-white, beaten to destroy stringiness, 75 minims of liq. ferri chlor., U. S. P., (corresponding to Friese's method

and proportions) were added. A light-yellow turbid magma was produced, which was mixed with an equal volume of water, transferred to a filter and washed with water until the washings passed colorless. The residue upon the filter, which was quite bulky, formed a gelatinous mass upon standing, and, when diluted with water after it had attained that condition, failed to pass through the filter. After several days the contents of the filter were further diluted with water and transferred to a new filter, when, very slowly, the solution passed through the filter. The clear liquid yielded, on evaporation, an albuminate of iron in the form of transparent yellowish-brown scales. Owing to unavoidable loss its quantity was not determined.

8. Simultaneously with this experiment (7) a parallel experiment was made in which liq. ferr. chlor. was evaporated to dryness, redissolved in water, filtered and then added to the pure egg-white (corresponding to Bernbeck's method and proportions). In this instance a copious precipitate was obtained which was quite distinct from that obtained by Friese's method, and may be described as granular. It was very readily washed, but when allowed to drain over night it had completely changed its character. A gelatinous thick liquid had formed, a portion of which had passed through the filter, and was consequently lost. The receiving vessel being changed, the liquid was further diluted with water, when it very slowly passed through the filter, forming a clear liquid. This yielded a dry albuminate corresponding in appearance with that obtained by Exp. 7. It was not weighed.

9. Two troyounces of egg-white were dissolved in 7 fluidounces of water, 5 fluidounces of solution of salt added and the solution filtered. The filtration proceeded quite slow when compared with the filtration of a similar solution of albumen to which ferric chloride had been added in place of salt. Upon the addition of 25 minims of liq. ferr. chlor., U. S. P., previously diluted with $3\frac{1}{2}$ fluidounces of water, a precipitate of albuminate of iron was obtained, just as in the instances in which the inverse process was employed, and the filtrate and washings gave very faint evidence of albumen, though the former gave decided evidence of iron. The albuminate produced had the same character as that obtained by Exp. 1.

10. The same quantity of the same egg-white was dissolved in water, the solution mixed with solution of salt, and filtered just as in Exp. 9. Diluted hydrochloric acid was then added drop by drop. When 25 drops had been added, the liquid became permanently turbid; with

5 drops more a decided turbidity was produced, and after adding 5 drops more, a further addition failed to produce a precipitate in the clear filtrate. The precipitated albumen was not subjected to nearer experiment, but it deserves a thorough examination since there were decided evidences of change, *it being no longer coagulable by heat*. Its quantity, also, was not determined, but it appeared to be less, both in volume and weight, than that obtained from the same albumen by precipitation with ferric chloride.

The first two experiments (7 and 8) have shown, beyond a doubt, that concentrated solutions of albumen (in the form of the natural egg-white) are readily precipitated by ferric chloride, either in the presence or absence of hydrochloric acid, but that the precipitates obtained under either condition again become soluble when the excess of ferric chloride has been removed by washing. They likewise show that while Bernbeck's view, that the solubility of the albuminate is due to excess of hydrochloric acid in the liq. ferri chlor. is probably incorrect, the condition in which the albuminate of iron is precipitated when ferric chloride, free from hydrochloric acid is employed, is of such a character that it can be readily washed so as to free it from excess of ferric chloride; while that obtained by Friese's method, being in a very finely divided condition, cannot be washed with the same readiness, and that, therefore, a portion of the precipitate, being completely freed from excess of ferric chloride, may again enter solution before the remainder is sufficiently washed.

Experiment 9 has shown that the process of precipitation, by the intervention of common salt, can be inverted so that the ferric chloride will act as the final precipitant.¹ The method, however, has the disadvantage in that the solution of albumen and salt filters very slowly, while that of albumen and ferric chloride filters with comparative rapidity. It is not clear, on the one hand, why common salt should effect the precipitation in dilute solutions of albuminate of iron, and why, on the other hand, ferric chloride should only precipitate albumen when it is in its natural solution. Both propositions must for the present be accepted as facts, which may find explanation by further experiments. It may be, furthermore, inferred that the small quantity of chloride of sodium and other salts, naturally present in egg-white in its concentrated natural solution, is sufficient to effect precipitation upon the addition

¹ This is already shown by Hager's method, but his method was not known to me at the time the experiment was made.

of ferric chloride; but in this event a much smaller quantity of the latter than that employed by Friese or Bernbeck should effect the same result.

Experiment 10 was made simply to determine the probable effect of an excess of hydrochloric acid in the liq. ferri chlor., and is, perhaps, of greater interest in its relation to albumen itself than in its relation to albuminate of iron. Judging from the action of ferric chloride, free from hydrochloric acid, upon albumen (Exp. 8), as well as from the evidently incomplete precipitation of albumen by the dilute hydrochloric acid (Exp. 10), it seems justifiable to conclude that in the precipitation of albuminate of iron in the presence of common salt the action of the ferric chloride is independent of the presence of free hydrochloric acid. The whole question in these bearings is, however, too intricate to be disposed of without further and comprehensive study, and may rest here for the present.

In the foregoing a ready method for preparing dry albuminate of iron has been given. It remains to consider whether the product obtained by the method is uniformly the same. In order to satisfy myself on this point the ferric oxide was determined by a method, which, for the purpose, appeared to me sufficiently accurate, but would not be sufficiently so if my object had been the establishment of a formula for the compound.

1.0 gram of albuminate of iron obtained by Exp. 4 was subjected to incineration, at a dull red heat, until it ceased to lose weight. The weight of the ash being ascertained, this was exhausted with water, the solutions obtained were evaporated, dried, and heated at an incipient red heat as long as it lost weight. The weight of soluble salts (principally chloride of sodium) so determined being deducted from the total ash, the quantity of ferric oxide in one gram of the original albuminate was ascertained, and from the figures so obtained the percentage of ferric oxide in the *pure* albuminate was determined as shown in the following:

1.0 gram albuminate, Exp. 4, incinerated until it ceases to lose weight =	0.121 gram ash
Ash yielded to water,	0.073 " salt
Difference is ferric oxide,	0.048 " Fe_2O_3
100 grams of the albuminate, therefore, contains 7.3 grams of salt	

and 92.7 grams pure albuminate of iron, representing 4.8 grams of ferric oxide.

Then, if 92.7 grams of pure albuminate contain 4.8 grams of ferric oxide, 100 grams of pure albuminate contain 5.16 grams = 5.16 per cent. Fe_2O_3 .

The experiment showed that the product obtained by the process of precipitation contains a considerable proportion of chloride of sodium. Remembering that the expressed precipitate was translucent in the centre and opaque in the margin, a portion of the clear central mass of the press cake obtained by Exp. 6 was dried and treated precisely as the above. The result was as follows:

1.0 gram clear albuminate, Exp. 6, yielded,	0.105 gram ash
Ash yielded,	0.056 " salt
Difference,	0.049 " Fe_2O_3

100 grams of this albuminate, therefore, contains only 5.6 grams of salt, and the pure albuminate of iron, constituting the remainder, = 5.19 per cent. Fe_2O_3 .

Equal portions of the three lots of albuminate of iron obtained according to Exp. 6 were now powdered together, and 1 gram of this powder treated as above. The result now was as follows:

1.0 gram mixed albuminate, Exp. 6, yielded,	0.120 gram ash
Ash yielded,	0.072 " salt
Difference,	0.048 " Fe_2O_3

Showing that 100 grams contained 7.2 grams of salt, and that the pure albuminate contained 5.17 per cent. Fe_2O_3 .

It remained now to subject the albuminates of iron obtained by Friese's (Exp. 7) and Bernbeck's (Exp. 8) methods to similar quantitative examination. But, inasmuch as the peculiar method by which these albuminates were obtained seemed to exclude the presence of saline components other than ferric compounds, these were simply incinerated, and the residue weighed as ferric oxide.

1 gram albuminate, Exp. 7, yielded	0.048 gram = 4.8 per cent. Fe_2O_3
1 gram albuminate, Exp. 8, yielded	0.048 gram = 4.8 per cent. Fe_2O_3

thus pointing to identity in their composition, notwithstanding that the one was obtained with normal solution of ferric chloride, and the other with ferric chloride which had been previously deprived of its excess of acid.

As before stated, the method of determination is not such as should be employed to secure that degree of accuracy that is necessary to determine the chemical constitution of albuminate of iron. The results are, however, sufficiently accurate to show that the compound obtained by the method of precipitation is uniform in its composition, and points out very clearly that an albuminate of iron of definite constitution exists.

What its precise constitution may be, however, is a question which I must leave to others, who have more time for such investigation, to decide; and I will simply observe in this connection that, if the formula of albuminate of iron represents 1 molecule albumen ($C_{144}H_{122}N_{13}S_2O_{22}=1612$) and 1 molecule ferric chloride ($Fe_2Cl_3=162.5$), the compound would represent 4.5 per cent. ferric oxide; or, if it represents 1 molecule each of albumen and ferric oxide ($Fe_2O_3=80$), it would contain 4.728 per cent. ferric oxide.

The following table shows the percentages of ferric oxide that have been obtained or are claimed for the different albuminates:

Albuminate.	Ferric Oxide.	Corresponding to	
		Metallic Iron.	Ferric Chloride.
If $Fe_2Cl_3.C_{144}H_{122}N_{13}S_2O_{22}$.	4.500 p. c.	3.147 p. c.	9.150 p. c.
If $Fe_2O_3.C_{144}H_{122}N_{13}S_2O_{22}$.	4.728 "	3.304 "	9.600 "
Friese's,	3.998 "	2.800 "	8.122 "
Biel's,	4.769 "	3.340 "	9.719 "
Hager's,	6.500 "	4.550 "	13.201 "
Diehl's, Exp. 4, .	5.160 "	3.612 "	10.479 "
Do. clear, " 6, .	5.190 "	3.633 "	10.540 "
Do. mixed, " 6, .	5.170 "	3.619 "	10.500 "
Friese's, " 7, .	4.800 "	3.360 "	9.748 "
Bernbeck's, " 8, .	4.800 "	3.360 "	9.748 "

Finally, my observations may be summed up as follows:

1. Albuminate of iron, in a dry condition, can be obtained with great ease by a method of precipitating its solutions with common salt.
2. So obtained, whether from solutions containing an excess of

ferric chloride or an excess of albumen, it is constant in its composition as regards the relation of albumen to iron.

3. The dried and powdered product is readily dissolved by water.

4. Obtained by the method recommended, it contains a certain percentage of common salt, the presence of which, however, does not interfere with its solubility, nor, it is likely, with its therapeutic application.¹

5. The process recommended is rapid, and conducted under conditions in which the albumen cannot be unfavorably affected by exposure to the heat of summer; and, even if exposed for a longer period than is necessary, the presence of salt is calculated to prevent the changes to which albumen or its compounds, in a moist condition, are subject.

6. The albuminate represents about 5 per cent. of ferric oxide, or 10 per cent. of ferric chloride.

Louisville, Ky., March 20, 1880.

PHARMACEUTICAL NOTES.

BY R. F. FAIRTHORNE, PH.G.

Emulsion of Codliver Oil and Phosphate of Calcium.—The following will be found to make a satisfactory and pleasant preparation:

R	Calcii phosphatis,	.	.	.	.	.	℥ii gr. viii
	Acid. hydrochlor.,	.	.	.	.	.	q. s.
	Liq. ammoniæ,	.	.	.	.	.	q. s.
	Aquæ,	.	.	.	.	.	f℥iii

Mix phosphate with a small portion of the water, and the acid in sufficient quantity to dissolve, filter through cotton and add the remainder of the water. Pour into this an excess of solution of ammonia,

¹ Dr. Hager recommends for his preparation, which is preliminarily obtained essentially like mine, that, after the addition of solution of salt, the mixture be diluted with a considerable quantity of water, the precipitate collected, and washed with water so as to remove the salt as much as possible. I have not had opportunity to test the value of this direction, though my observations lead me to fear that the entire precipitate might by such procedure again enter solution. Some experiments made within the last few days show that a considerable quantity of the salt can be removed from the dry powder by shaking it with water and immediately throwing the mixture on a filter. The larger portion of the liquid passes colorless, and contains much salt; but the residue on the filter very soon assumes a gelatinous condition, and finally dissolves. It is my opinion that the larger part of the salt may be removed from the moist press-cake by immersing it in water until it begins to exercise solvent action on the albuminate, then removing the cake and drying.

wash the precipitate on muslin until the washings are tasteless, and, after thoroughly squeezing it, mix it with the following ingredients, viz.:

Ol. morrhuae,	f3iii
P. g. acaciæ,	3vi
P. sacchari albi,	3x
Ol. sassafras,	gttxv
Ol. gaultheriæ,	gttvi
Ol. cinnamomi,	gttiv
Aquæ, q. s. ft.,	f3viii

Rub the phosphate of calcium with the sugar and gum in a mortar, and water sufficient to reduce it to the consistence of cream, add this to the oil previously put in a bottle and shake well for a few minutes. The rest of the water may then be poured in a little at a time. The essential oils can be mixed with the codliver oil.

How to Preserve Tragacanth Paste.—To half a pint of tragacanth paste are added 25 drops of oil of sassafras. This will be found to preserve it without spoiling for three months, even in warm weather.

A quick way to make Paregoric.—If, instead of powdered opium, a quantity of tincture of opium containing an equivalent proportion is used, paregoric can be made in ten minutes equal in every respect to the official, provided the laudanum used is of proper strength, thus:

R Tinct. opii,	f3iss and 48 minims
(which contains the medicinal virtues of 1 drachm of p. opium)	
Acid. benzoic.,	sixty grains
Camphoræ,	forty grains
Ol. anisi,	one fluidrachm
Mel. desp.,	two troyounces
Alcohol. dilut.,	thirty and one-half fluidounces

Mix and filter.

XANTHOXYLUM CAROLINIANUM.

BY GEORGE HAVENS COLTON, PH. G.

(From an Inaugural Essay.)

A quantity of the bark was carefully examined to insure its identity and freedom from admixture with other barks. A portion of the bark was exhausted with alcohol and the tincture evaporated to the consistence of a soft extract. This was treated with petroleum benzin until a portion of the benzin left no residue on evaporation. Upon evaporating, a residue was obtained, consisting of a greenish colored fixed oil, of an intensely acrid taste, soluble in alcohol, ether and chloroform, and mixed with a crystalline substance.

These crystals, after freeing from oil by washing with benzin, and repeated crystallization from alcohol, were obtained in tasteless, colorless silky needles, readily soluble in alcohol, ether and chloroform, less soluble in benzin, insoluble in boiling water or solution of potassa. When heated on platinum foil they fused, and burned with a smoky flame. Gently heated on paper the substance fuses to a transparent resinous mass, which dissolved in alcohol, and can be obtained in crystals on evaporation of the solution. From these reactions it was considered to be a crystallizable resin.

The remainder of the extract, after treating with benzin, was repeatedly washed with ether; the ether evaporated, and the residue dissolved in a little alcohol and poured into water, which precipitated a soft brown somewhat acrid resin, soluble in alcohol, ether and chloroform; insoluble in benzin, and but sparingly soluble in solution of potassa.

The undissolved portion of the extract was treated with water, which almost entirely dissolved it, leaving a tasteless residue. The aqueous solution was mixed with calcined magnesia, and carefully evaporated to dryness, and exhausted by repeated boiling with alcohol, which on evaporation left a bitter yellowish mass. This was dissolved in water and solution of tannin added, as long as a precipitate was produced, which was collected, washed with a little water mixed with oxide of lead, and carefully dried. This was treated with boiling alcohol, and the liquid found to be free from bitter taste, and to leave no residue on evaporation. A portion of the precipitate which had been treated with alcohol, was mixed with water, solution of acetate of lead added, and boiled for a few minutes and filtered. The filtrate, after removing the lead by sulphuretted hydrogen, filtering, and evaporating to a small bulk, was free from bitter taste; the bitter principle appearing to have been entirely lost.

The drug which had been previously exhausted with alcohol, was next percolated with water and yielded a very bitter infusion, which was evaporated to a small bulk and poured into alcohol, which precipitated a considerable amount of gum. After separating the gum, most of the alcohol was recovered by distillation, and the residue mixed with magnesia, and evaporated on a water-bath to dryness. This was then washed with successive portions of alcohol, until the washings ceased to have a bitter taste, and the washings evaporated. The residue was dissolved in water, and found to contain a small amount of tannin, which was removed by solution of subacetate of lead. The lead was

removed with sulphuretted hydrogen and the filtrate, after boiling, allowed to stand for some time in contact with animal charcoal, which absorbed the bitter principle.

The animal charcoal was then thrown on a filter and washed with cold water to remove sugar, which was found to be present by Trommer's test, and was obtained in an uncrystallizable condition on the evaporation of the washings. The residue on the filter was then dried and exhausted with hot alcohol, which on evaporation yielded a yellowish mass, having an intensely bitter taste; soluble in alcohol and water, but insoluble in benzin, ether and chloroform. With concentrated nitric acid it produces a bright red color, which slowly fades to yellow. Sulphuric acid gives a purplish-brown coloration. Molybdate of ammonium, dissolved in sulphuric acid, produces a purple color with tinge of brown, changing to red, then orange, and finally pale yellow. Its aqueous solution yielded precipitates with the following reagents: With solution of iodohydrargyrate of potassium, yellowish-white; with mercuric chloride, white; with platinic chloride, yellowish-white; with iodine, in solution of potassium iodide, orange, and with solution of tannin, greyish-white. From the above reactions the bitter principle of the bark was considered to be an alkaloid.

A portion of the bark by distillation with water yielded a trace of volatile oil, enough of which could not be obtained for examination.

Five grams of the bark were incinerated and yielded sixty-two centigrams of ash, equal to twelve and two-fifths per cent., of which twenty per cent. was soluble in water, and eighty per cent. soluble in hydrochloric acid. An analysis showed the presence of potassium, calcium, and magnesium, existing as chlorides, carbonates and phosphates.

TESTS FOR ARSENIC.

BY PHIL. HOGAN, PH.G.

In a recent trial of a woman in Coshocton county, for administering arsenic to her husband, who died August 13th, 1879, with all the symptoms of arsenical poisoning, the toxicologist, who made an examination of the viscera of the deceased and found four-fifths of a grain of arsenic in the liver, and traces in the stomach and intestines, used Reinsch's and Marsh's tests, and proved the metallic spot on porcelain, produced in Marsh's test to be arsenic by the hypochlorite of sodium and the nitrate of silver tests, and the production of octahedral crystals in

Reinsch's test, as distinguishing arsenic from antimony. The cross-examiner read from a work on jurisprudence, that the hypochlorite of sodium test was wholly unreliable, *as it would also dissolve the antimonial spot*, though more slowly. This is in direct conflict with the U. S. Dispensatory, p. 34, fourteenth edition. Query: Which is correct? The production of octahedral crystals, which is considered so characteristic of the arsenical sublimate, was shown to be unreliable from a recent statement of Prof. Wormley's, that antimony, under certain conditions, *will produce octahedral crystals, which cannot be distinguished in appearance from those of arsenic*. This seems to destroy a distinguishing test for arsenic, hitherto considered as one of the most delicate and reliable. If antimony does act like arsenic under certain conditions, perhaps the "Journal" can give those conditions. The toxicologist should know what they are. The woman was acquitted, and we have no doubt, the fact that subnitrate of bismuth had been prescribed for the deceased had its weight with the jury. The arsenic might have been an impurity in the subnitrate of bismuth. Lesson: Every druggist should test his bismuth preparations and be sure of the absence of arsenic.

Newcomerstown, O., March 19th, 1879.

NOTE BY THE EDITOR.—It is to be regretted that the author does not give the alleged authority for the solubility of antimony in hypochlorite of sodium. Taylor (On Poisons) states that "a solution of chloride of lime does not dissolve the antimonial deposit." Dragendorff (Ermittelung von Giften) and Schwanert (Pharmaceutische Chemie) state that the antimonial spots are insoluble in hypochlorite of sodium, which is free from uncombined chlorine. Dragendorff calls this test an excellent (vortrefflich) one and recommends preparing the solution by decomposing chlorinated lime with carbonate of sodium.

Regarding the production of octahedral crystals from antimony, Prof. Wormley has kindly sent us a reprint of his paper "Fallacies of Reinsch's test for arsenic," which appeared in the "Amer. Journal of the Medical Sciences" for October, 1877. It will be observed from this paper, which we reproduce in full as far as it relates to this subject, that while it is possible to obtain from an antimony deposit octahedral crystals, which in themselves are not to be distinguished from those obtained from arsenic, yet the general character of the antimony

sublimate differs widely from that produced from arsenic. We quote from Prof. Wormley's paper as follows :

The statements in regard to the behavior of the antimony deposit, however, have been somewhat discordant. Thus, by some writers, it is stated that this metal fails to yield any sublimate whatever; by others, that it yields an amorphous sublimate; and by others still, that the deposit is either amorphous or granular. According to Professor W. A. Miller, however, the antimony deposit, when heated, "gradually becomes oxidized, and at a higher temperature the oxide is volatilized, condensing in needles; not, like arsenic, in octahedra." "Elements of Chemistry," ii, p. 602.

This statement of Professor Miller was strongly urged a few years since in a somewhat noted trial as evidence of the *absence* of antimony, since on the application of the copper test there was a failure to obtain crystalline needles. Immediately after this trial, in 1872, we very carefully examined this test in regard to the character of the sublimate produced by antimony. In over fifty consecutive experiments of this kind, in which copper, pretty heavily coated with antimony, but used in small portions at a time, was employed, we failed to obtain well-defined crystalline needles, except in some three or four instances in which a few needles were observed, and in one in which the sublimate consisted largely of large groups of prismatic needles with single prisms.

But, what is of more importance in a forensic point of view, we found that the sublimate produced from antimony might contain *octahedral crystals* of antimonious oxide, and that under certain conditions it was almost sure to contain such crystals. In a number of instances sublimate was obtained, which, when examined under the microscope, presented fields which, taken alone, could not be distinguished from an arsenical sublimate by the most experienced eye.

These octahedral crystals are more likely to form when the heat is applied very gradually, and especially when the reduction-tube is relatively large to the quantity of deposit submitted to sublimation. In no instances were octahedral crystals obtained when a very narrow or contracted tube was employed. It would thus appear that for the production of crystals, antimony required a more free supply of air than arsenic, although the absolute quantity of oxygen required is less.

Although it is thus possible to obtain from antimony sublimate, certain portions of which, under the microscope, are not to be distinguished from the results obtained from arsenic, yet there is considerable difference in the general behavior of these metals under the action of this test.

1. The antimony deposit requires a much higher temperature to volatilize it, vaporizing at little, if any, below a dull red heat; whereas, according to recent investigations, metallic arsenic volatilizes at about 356°F., or, according to Professor Guy, even so low, when in small quantity, as 230°F.

2. The position of the sublimate in the reduction-tube, as usually obtained, may serve at once to distinguish the antimonial from the arsenical deposit. In the case of antimony, on account of its less volatility, the lower margin of the sublimate (in which the crystals, when present, are found) is only slightly in advance of the slip of copper, or the sublimate may even form on the sides of the tube surrounding the copper, especially when the heat is restricted to the lower end of the tube; whilst, as is well known, in the case of arsenic the sublimate usually forms half an inch or more in advance of the copper foil.

3. The general appearance of the sublimate under the microscope, even when octahedral crystals are present, usually differs very greatly from that obtained from arsenic, the octahedra being confined to the lower margin of the sublimate, and many more appearing opaque than in the case of that metal, and there being many granular and opaque points interspersed among the crystals. Moreover, only a single field, or at most a very small portion of the sublimate will present crystals, the other portions being either wholly amorphous, or at most granular.

As is well known, the arsenical sublimate, as usually obtained, consists wholly of octahedral crystals, which gradually diminish in size from the lower portion of the sublimate to the upper margin, where, under a low power of the microscope, they may appear as mere points; which, however, under a higher power of the instrument, will be found to be perfect octahedra.

In a large series of experiments, after the manner in which this test is ordinarily applied for the detection of arsenic, we in no instance obtained from antimony a sublimate that could not readily be distinguished from a pure arsenical deposit; yet it must be borne in mind that, under certain conditions, it is possible to obtain from antimony a sublimate consisting largely, if not wholly, of octahedral crystals, and presenting to the naked eye the sparkling appearance usually presented by the arsenical sublimate. In the instance already mentioned, in which large groups of prismatic needles were obtained, very many octahedra were interspersed among the prisms.

From the foregoing statements it is obvious that the mere production of octahedral crystals by this test is not, in itself, conclusive proof of the presence of arsenic. When examining this test in the preparation of the *Micro-Chemistry of Poisons*, we in a few instances observed minute octahedra, which at the time were attributed to the presence of a trace of arsenic in the antimony compound employed. The entire absence of that metal in the present experiments was fully established.

We also find that the deposit of metallic antimony formed in the exit tube of a Marsh apparatus by decomposing antimonuretted hydrogen by heat, may, when the tube is detached and the deposit again heated, be in part at least converted into octahedral crystals of the oxide.

If pure antimonious oxide be vaporized in a small tube, the sublimate usually contains octahedral crystals, but sometimes crystalline needles. According to our experiments, octahedra are much more likely to be present than needles; the opposite result, however, is stated by several writers.

Our experience has confirmed the observation first made by Mitcherlich, that when a solution of tartar emetic is decomposed by excess of ammonia, the precipitated antimonious oxide is after a time converted, in part at least, into minute octahedra.

CHEMICAL NOTES.

BY PROF. SAMUEL P. SADTLER.

Inorganic Chemistry.—*On Vesbium, a New Element.*—A. Scacchi has communicated to the Academy of Sciences, of Naples, the result of an investigation of the green and yellow incrustations which coat the Vesuvian lava of 1631 in numerous fissures. These coatings con-

sist of silicates containing copper, lead, and a body which Scacchi considers to be new, and which he calls *Vesbium*, from the old name of Vesuvius. As yet only a few tests have been made with it. He considers it as existing in the form of a metallic acid, of reddish color, which yields colorless salts with the alkalies, and these, on the addition of an acid, become yellow. The silver salt is red or yellowish-red, the copper salt yellowish-green. Hydrogen sulphide gives a brown precipitate and a bluish liquid, becoming brown on the addition of zinc. Salt of phosphorus gives a yellow bead in the outer flame and a green bead in the inner flame. Scacchi does not consider molybdenum or vanadium to be present, although Rammelsberg, who reports the announcement to the Berlin Chemical Society, thinks these properties point to the presence of the latter element.—*Berichte der Chem. Gesell.*, xiii, p. 250.

Properties of Norwegium, a recently announced New Element.—Dahll, the discoverer of this element (this journal, 1879, p. 447), communicates the following as to its properties: It is white, not very malleable, has a specific gravity 9.44, fuses at near 350°C ., and dissolves in nitric acid with blue color, which on dilution becomes green. The reduction of its brown oxide in hydrogen gave as the amount of oxygen present 9.6 and 10.15 per cent. On the supposition that the formula of the oxide is NgO , the atomic weight of Ng would be 150.6 or 141.6. The solutions are precipitated by alkalies, with green color, the precipitate dissolving, however, in excess of alkali, with blue color. Hydrogen sulphide gives a brown precipitate, insoluble in alkaline sulphides. Zinc reduces the sulphate solution, producing at first a brown coloration, and on boiling yielding the metal. Before the blowpipe a yellow glass is obtained, which becomes blue on cooling, and treatment with soda or charcoal yields a yellowish-green incrustation.—*Ibid*.

Organic Chemistry.—*A Contribution to Knowledge of Protein Substances.*—A. Stutzer makes the announcement of his discovery of a method for the quantitative separation of albuminoids from other nitrogenous substances occurring in plants. He finds that the hydrated cupric oxide, recommended for the precipitation of dissolved protein matters, can be used for the separation of these protein materials from nitrogenous substances such as amygdalin, solanin, leucin, tyrosin, asparagin, from alkaloids, mustard-oils, nitrates and ammonia salts. All the protein materials studied by him can be classified according to the action of acid gastric juice (pepsin and hydrochloric acid) upon them, into two groups of bodies. There are formed, on the one hand, the

known decomposition products of albuminoids, the soluble peptones, acid albuminates, etc., and on the other hand a portion, of definite amount, remains completely indigestible. This last appears to contain phosphorus as well as nitrogen.—*Ibid.*, p. 251.

On Hyoscyamina.—Ladenburg has followed up his study of the *tropéins*, or artificial alkaloids, lately described (this journal, March, 1880, p. 148), by a more specific study of this natural alkaloid. Its close physiological relationship to atropia seemed to make this very important. The alkaloid on treatment with barium hydrate is decomposed, in a manner analogous to that observed with atropia, into hyoscinic acid and a base hyoscina. The analyses of both of these decomposition-products give figures identical with those gotten from tropic acid and tropin, the products of the decomposition of atropia by barium hydrate. The fusing-points and other physical characters also agree. Ladenburg says that three explanations only are possible of the certainly established difference between atropia and hyoscyamia: 1st, the hyoscinic acid may be different from tropic acid; 2d, hyoscin may differ from tropin; or, 3d, the decomposition products of the two alkaloids may be identical, but the component parts of the two natural substances may be differently united, so that their isomerism may be of a character analogous to that existing between oil of gaultheria and methyl-salicylate. The author thinks that his study of the "*tropéins*" from the two bases will enable him to settle the question of identity.—*Ibid.*, p. 254.

On Duboisina.—This alkaloid, which comes from the Australian plant *Duboisia myoporoides*, has already taken an important place among the remedies of eye-clinics; for, although similar to atropia in action, it is capable of use under circumstances where this latter is forbidden. Ladenburg has proved the complete identity of the purified alkaloid with hyoscyamia. He establishes this by an analysis of both the gold salt and the purified alkaloid itself. The following reactions, moreover, hold true of both alkaloids. The addition of picric acid to the dilute hydrochloric acid solution gives a yellow oil, which solidifies almost immediately to beautiful and regular plates; platinic chloride produces no precipitate; iodine in iodide of potassium solution produces at once a separation of a crystalline periodide; tannic acid produces a slight turbidity; double iodide of potassium and mercury produces a white amorphous precipitate.—*Ibid.*, p. 257.

Technical and Applied Chemistry.—*Fire-proofing Materials and*

Mixtures.—The following mixtures for rendering textile fabrics, paper, straw, etc., fire-proof, form the basis of a recent English patent, issued to Martin and Tessier, in Paris:

No. 1.	Pure ammonium sulphate,	8 kilograms
	Carbonate of ammonium,	2.5
	Boracic acid,	3
	Pure borax,	1.7
	Starch,	2
	Water,	100

The articles are to be dipped into the boiling solution.

No. 2.	Boracic acid,	5 kilograms
	Sal ammoniac,	15
	Potassium feldspar,	5
	Gelatin,	1.5
	Flour paste,	50
	Water,	100

This is to be applied to wood, theatre accessories, etc., with a brush.
—*Chemische Industrie*, Jan., 1880, p. 25.

Separation of Fats and Resins from Soaps.—This is effected, according to J. Wolff, by the use of commercial anilin, which, by conversion into the hydrochlorate, filtration of the aqueous solution through moistened filters, precipitation with caustic soda and removal of the salt, is freed from any admixture of benzol or nitro benzol. The product so obtained is distilled, and only the part boiling over 180°C. used. This will dissolve fats and resins in the cold, but will not dissolve soaps. The mixture to be treated is gotten into a finely-divided condition and then treated with 10 to 20 volumes of anilin, while the mixture is stirred and any hard lumps are broken. After one-half to three-quarters of an hour digestion on the water-bath it is allowed to cool and then filtered. The filtrate is treated with an excess of hydrochloric acid and then with three to four parts of water. The cold solution is then shaken up with ether and the ethereal layer removed. This, on evaporation, leaves the fats and resins of the original mixture. —*Ibid.*, p. 28.

Manufacture of Carbon Disulphide.—The following*interesting description is of the manufacture of carbon disulphide as carried out on a large scale by M. Deiss at Marseilles, France. Four vertical fire-clay retorts, 1.8 meter in height and 0.4 meter in diameter, are placed together in an oven and are filled with charcoal. When this has been brought to a glow, crude powdered sulphur is introduced by means of a fire-clay tube reaching down to beneath the double bottom of the

retorts. This tube, after each charging, is stopped with a ball of plastic clay. The escaping bisulphide vapors pass through wide sheet-iron tubes into large closed iron receivers, which are cooled from the exterior and have an exit tube for the uncondensed vapors. These pass into a second receiving chamber, which is provided with partition walls, and a circulation of the vapors is thus brought about, so that further condensation takes place. The uncondensed vapors then pass through water and out into the chimney. Each retort yields 100 kilograms carbon disulphide per 24 hours, and of the sulphur used 90 per cent. is converted into disulphide. The product is shipped in iron casks of different sizes and special directions for emptying these are sent with them. The present price is 40 francs per 100 kilograms. The current production is 1,200,000 kilograms annually, but a considerable enlargement of the works is under way.—*Ibid.*, p. 8.

GLEANINGS FROM THE GERMAN JOURNALS.

BY LOUIS VON COTZHAUSEN, PH.G.

Mercurial Ointment (see "*Amer. Jour. Pharm.*," March, 1880, p. 138 to 142).—Dieterich states, as an addition to his numerous experiments, that the ointment may also be prepared readily without using old ointment, or any other addition, by first extinguishing a minute quantity of the mercury with the lard, and then adding, very slowly and gradually, larger quantities of the mercury. This method proved so successful that the author thinks it ought to be made official. He also endeavored to utilize Collier's method of separating mercury into minute particles with tincture of quillaia (see "*Amer. Jour. Pharm.*," Jan., 1880, p. 41), but was unsuccessful, the metal running together again as soon as an endeavor is made to mix with the lard.—*Pharm. Centralb.*, Jan. 29, 1880, p. 39.

Extinction of Mercury with Soft Paraffin.—Dr. E. Weber corroborates Godeffroy's, and contradicts E. Dieterich's statements in regard to the use of vaselin for extinguishing mercury (see "*Amer. Jour. Pharm.*," March, 1880, p. 141). He prepared 1,500 grams of dark and uniformly colored ointment in less than one-half hour. He first triturated 500 grams of mercury with 160 grams of vaselin for five minutes, when globules of mercury were no longer visible either with the naked eye or by means of a magnifier, and then added gradually the almost cool mixture of 280 grams of suet and 560 grams of lard.—*Pharm. Ztg.*, Feb. 7, 1880, p. 79.

American Nostrums.—Hager gives the following as the composition of the nostrums advertised as Dr. August Kœnig's family medicines.

Hamburg breast tea is a mixture of marshmallow root, licorice root, red poppy petals, mallow flowers, marshmallow flowers, flowers of a stellaria, colored by saffron, and coarsely powdered rock candy, flavored with the oils of anise and fennel.

Hamburg drops are similar to the well-known elixir of life or Swedish bitters, but contain more white agaric, and are rendered thicker by the addition of inspissated juice of juniper berries.

St. Jacob's oil is a good oil of turpentine, to which a small quantity of oil of rosemary and oil of lavender has been added, and tinged light red with alkanet or red saunders.—*Pharm. Centralb.*, Jan. 29, 1880,

p. 42.

Globuli Peptici, Dinner Globules or Dinner Pills.

R	Cinchonidiæ sulphatis,	5'0
	Pepsini,	30'0
	Pulveris zingiberis,	
	Pulv. pimentæ,	
	Pulv. cardamomi,	aa 3'0
	Pulv. gentianæ,	
	Pulv. althææ,	
	Pulv. tragacanthæ	aa 6'0
Mix,	and add a mixture of glycerinæ,	10'0
	Acidi muriatici,	
	Aquæ,	aa 6 0

✓

Mix into a pilular mass; divide into 300 or 360 globules; dry gradually, and coat with sugar or any other good coating.

Dose, 1 or 2 pills (globules) to children, and from 4 to 6 to adults. These pills are warmly recommended by Hager for assisting digestion after a hearty meal.—*Ibid.*, Jan. 29, 1880, p. 37.

The Cinchona Alkaloids exist in the bark of the stem of *Cinchona succirubra*, according to Dr. J. E. De Vrij, as cinchotannates, and may be partially extracted by cold water under the influence of a soluble acid or acid compound existing in the bark. Practically not more than three-sevenths of the total alkaloids can be thus removed, the remaining four-sevenths being, however, readily taken up with dilute hydrochloric acid. The author's investigations show that the cinchotannates of the alkaloids, which rotate polarized light towards the right, are more soluble than those of the alkaloids, which rotate towards the left. The author makes—

Extractum Cinchonæ liquidum by mixing the powdered cinchona bark into a thin paste with water, adding sufficient normal hydrochloric acid (the quantity required is calculated from the known percentage of alkaloids in the bark used), transferring to a percolator, percolating with water and evaporating the percolate until the weight of the residue equals that of the bark used. De Vrij considers that quantity of hydrochloric acid sufficient which transforms the alkaloids present in the bark into acid hydrochlorates, readily soluble in water; the cinchotannic acid is of course set free and dissolves in the water. As basis for his calculations he assumes that 320 grams of mixed alkaloids require 73 grams of anhydrous hydrochloric acid. The normal hydrochloric acid of the author is a liquid containing 36.5 grams HCl in a liter.

Extractum Cinchonæ solidum is made like the fluid extract, except that the evaporation is continued until the extract has the proper consistence.—*Archiv d. Pharm.*, Jan., 1880, p. 34, from *Haaxmann's Tydschr. voor Pharm.*

Chinoidin is, according to Burdel, even superior to quinia as a remedy for malarial fever and quartan ague, and only has less efficacy than quinia in the treatment of acute intermittent fever. Hager modifies this statement; he admits that chinoidin, if pure, is very efficacious as an antifebrile remedy and stomachic, but regards it as inferior to quinia as a tonic. He recommends the use of the other cheap cinchona alkaloids, because the appearance and other properties of chinoidin greatly encourage and facilitate adulteration, the detection of which is often comparatively difficult.¹ Hager found chinoidin in doses of 1.0 to 1.5 gram, combined with an acid, a mild and painless but effective purgative, which does not apparently weaken the body.—*Pharm. Centralb.*, Feb. 5, 1880, p. 49.

Quebracho Bark (see also "Amer. Jour. Pharm.," 1879, p. 192, 309, 472, 554, 557, and Feb., 1880, p. 92).—O. Primke was informed by Dr. Hieronymus, who is connected with the university at Cordoba, Argentine Republic, that the wood and bark of the following four trees appear in commerce as quebracho.

1. *Aspidosperma quebracho*, *Schlechtendahl*, N. O. Apocynaceæ, common name, Quebracho blanco. This tree grows in the province of Catamarca and is used by the natives for malaria and asthma.

¹ The possibility of adulteration is scarcely sufficient reason for discarding the use of a valuable remedy, which has the additional recommendation of cheapness.—EDITOR.

2. *Loxopterygium* (*Quebratschia*) *Lorentzii*, Grisebach, N. O. *Terebinthaceæ*, common name, *Quebracho colorado*. The wood and bark are used for tanning purposes; the tree grows particularly in the province of Corrientes.

3. *Iodina rhombifolia*, Hooker et Arnot, N. O. *Aquifoliaceæ*, common name, *Quebracho flojo*. Wood and bark are often mixed with that of No. 2.

4. *Machærium fertile*, Grisebach, N. O. *Leguminosæ Dalbergiæ* syn. *Tipoana speciosa*, common name, *Tipa*. This tree also yields wood and bark for tanning purposes, both of which possess less value than No. 2.—*Pharm. Ztg.*, Jan. 31, 1880, p. 64.

Extract and Tincture of Quebracho.—The "*Journ. des Connaiss. Medic.*" recently published a formula for so-called quebracho extract, according to which the quebracho bark is exhausted by digesting for eight days with alcohol, when the liquid is evaporated to dryness, the residue dissolved in water, the filtered liquid again evaporated, and ultimately the residue is dissolved in sufficient water to obtain a preparation having double the weight of the bark used. This preparation is of one-half the strength of the fluid extracts of the United States. Dr. Vulpius considers it a poorly-prepared tincture, which will not keep, and is sold at a price fifteen times as high as the original bark. The following formulas are considered to yield far superior preparations:

I. *Tinctura Quebracho spirituosæ*.—Quebracho wood, 100·0; alcohol and distilled water, of each 225·0. After digesting for eight days, express and filter.

II. *Tinctura Quebracho aquosæ*.—A convenient quantity of rasped quebracho wood is extracted on a steam-bath twice successively with 10 times its weight of water; the mixed extractions are allowed to settle, strained and evaporated to the consistence of a thick extract, when sufficient water is added to make the total weight equal to the weight of the wood used. After allowing to stand in a cellar for a few days, the liquid is filtered, and sufficient cold water is added through the filter to make the weight of the filtrate again equal to the weight of the wood used. Both of these tinctures have a handsome red color, a strong, bitter, astringent taste, and keep well.—*Ibid.*, Feb. 4, 1880, p. 70.

Jaborandi leaves have again been carefully investigated by F. Miller and F. Budee. The so-called genuine (*Pernambuco*) *jaborandi* of Dr. Coutinho consists of the leaves of a *Pilocarpus*, probably of *P. pinatifolius* and *P. selloanus*. The stems ought to be removed because

they contain no, or very little, pilocarpina, the active principle. The leaves of a plant belonging to nat. ord. Piperaceæ, probably *Piper lætum*, appear in the market as Brazilian jaborandi. Budee endeavored, but was not able, to isolate an alkaloid from this plant. Those leaves of *Pernambuco jaborandi*, the lower side of which is hairy, are more efficacious, *i. e.*, contain more alkaloid, than those that are not. The percentage of impure alkaloid amounts to almost 1 per cent. of the leaves, and the percentage of the pure nitrates obtainable varies between 0.3 and 0.7 per cent.

Pure pilocarpina is a thick, oily, light yellow liquid; the nitrate is white and light; the chloride deliquesces and decomposes readily.

Pilocarpus pinnatifolius grows in Brazil, principally in the provinces of Mattogrosso, Piauha, Ceará and St. Paulo. *P. selloanus* is indigenous to Southern Brazil and Paraguay, and principally enters commerce by way of Rio de Janeiro. *Piper lætum* also grows in Brazil, in the vicinity of Rio de Janeiro.—*Archiv d. Pharm.*, Jan., 1880, p. 1427.

Adulterated Fennel.—During the past winter much of the fennel met with in the German market was adulterated with previously-extracted fennel. On account of the unfavorable weather but little fennel of handsome appearance was harvested, and as most of it possesses such a poor color the addition of previously-extracted fruit is apt to escape observation.—*Pharm. Zig.*, Feb. 7, 1880, p. 80.

Volatile Alkaloid in *Aethusa Cynapium*.—By distilling the contused fruit of this plant with milk of lime, W. Bernhardt obtained a reddish-yellow liquid, floating like oil on the aqueous distillate. Both this oily liquid in alcoholic solution and the aqueous distillate possessed a strongly alkaline reaction, and an exceedingly penetrating, offensive odor, resembling the odor of rancid fish-oil. The author considers the oily substance a volatile alkaloid, the formation of which is analogous to that of trimethylamin from *Chenopodium vulvaria*, when treated similarly. He intends to further investigate its nature.

Ficinus first discovered this alkaloid, called it "*Cynapin*," and alleges to have obtained it in crystals, while Walz described an alkaloid very similar to that found by Bernhardt.—*Archiv d. Pharm.*, Feb., 1880, p. 117.

Coloring Matters of Grapes and of Huckleberries (*Vaccinium myrtillus*, Lin.).—The extensive investigations made by A. Andrée show that:

1. The natural blue coloring matter of grapes never varies.

2. It is not altered by fermentation, but is dissolved in the alcoholic acidulous liquid, the color being changed to red.

3. The grapes grown in Southern France contain more coloring matter than is necessary to give the wines a very dark color.

4. The shade of color is no criterion for the quality of wines.

5. The color will not serve to distinguish fermented grape-juice from the fermented juice of huckleberries.

6. Young wines always have a bright colored foam.

7. The coloring matter of wine is a mild acid, which will combine with lead oxide, and this compound is again destroyed by acids.

8. The addition of ammonia changes the red natural color of wines to blue, and if used in excess, or too concentrated, destroys the coloring principle altogether. The blue color produced by ammonia is the original natural coloring matter of the grapes, restored by neutralizing the acid which had turned it red.

9. Old wines usually yield a green reaction with ammonia.

10. The juice of fresh as well as of old huckleberries has the same behavior towards ammonia as young and old wines.

11. The coloring principle of grapes is identical with that of huckleberries.

12. The coloring principle is not altered by age, the varying reactions of old and fresh juice being caused by other circumstances, the exact nature of which will be further investigated by the author.—*Ibid.*, Feb. 1880, p. 90-112.

Canadian Castor.—Three sacs, having the well-known characteristic external appearance, were examined by Ed. Janota. Two of them possessed all the properties of genuine Canadian castor, while the third did not possess the peculiar odor of castor, and consisted of fibres, and a large quantity of hair, thoroughly saturated with a reddish-brown sticky fluid. A fraudulent adulteration seeming impossible in the closed sac, and improbable even if possible, because a heavier substance, less readily detected, would in such a case have been substituted in the sac for the removed castor, the author came to the conclusion that the altered condition of the contents was due to a diseased condition of the living animal.—*Pharm. Post*, Feb. 1, 1880, p. 48.

Poisoning by Carbolic Acid.—A midwife was recently sentenced to two months' imprisonment at Frankfort for causing the death of a child, by applying liquid carbolic acid, containing 88 per cent. of the

acid, to an open sore. The child immediately fell asleep, and died a few hours later.—*Pharm. Ztg.*, Feb. 7, 1880, p. 78.

As an Antidote for Carbolic Acid Intoxication, caused by continued external application of a 5 per cent. solution of the acid, Sonneberg recommends sodium sulphate, 5 to 8 grams of which he administered in 200 grams of water to adults, and 2 to 5 grams in 200 grams of water to children. The urine is at first dark green, and has a slightly brownish tint, but soon acquires again its normal color, when the carbolic acid application may be continued.—*Ztschr. d. Allg. Oest. Apoth. Ver.*, Jan. 20, 1880, p. 43, from *Apoth. Ztg.*

Arsenic in the Animal Organism.—In contradiction to Sclodowsky's statements, Prof. E. Ludwig claims as the result of numerous chemical analyses made by him, that in chronic as well as in acute arsenical poisoning the quantity of arsenic traceable in the brain is very minute, while much larger (frequently 90 times as large) quantities are found in the liver; and he therefore recommends the liver, and in cases of acute poisoning, the kidneys, as the portions of the body most suitable for legal chemical investigations.—*Pharm. Post*, Jan. 16, 1880, p. 25.

PREPARATION AND PROPERTIES OF PURE EMETIA.

BY DR. PODWYSSOTZKI.

(Translated and abridged from "*Pharm. Ztschr. f. Russl.*," 1880, p. 1-8, by LOUIS VON COTZHAUSEN, Ph.G.)

I. PREPARATION.—Either one of the two following methods yields satisfactory results:

1st method.—Treat the powdered ipecacuanha first with ether and then with petroleum benzin, in order to remove the liquid oil, the white fatty or waxy matter and those coloring matters which are soluble in the solvents named,¹ then extract the powdered root two or three times successively, at a moderate heat, with 85 per cent. alcohol, without adding any acid; evaporate the mixed tinctures to a syrupy consistence, add after cooling a very concentrated solution of as much ferric chloride as corresponds to from 10 to 13 per cent. of the weight of the powdered ipecac used, mix the mass well, add sodium carbonate in excess, boil the mass in a flask on a water-bath with successive small portions of

¹ Some ipecacuanhas, yielding much emetia, contain a principle soluble in ether, crystallizing in straw yellow needles and forming with barium hydrate and with alkalis purple compounds; the principle might be called *erythrocephalein*.

petroleum benzin (in which the emetia dissolves), shaking frequently, and continue to use fresh portions of the menstruum until no more emetia goes into solution; the filtered benzin solutions are mixed, and, if concentrated, the mixture is allowed to stand for twelve hours in a very cool place, when almost all of the emetia will separate pure as a white precipitate. If, however, the mixture is not very concentrated, atmospheric air is blown through it for some time, when pure emetia will separate in white flakes. By concentrating or evaporating the benzin solution, however slowly, pure white emetia is *never* obtained. The emetia should be collected quickly on a filter and dried over sulphuric acid.

2d method.—The first method may be modified by triturating the powdered ipecac into a thick paste with a little hydrochloric acid, adding sufficient ferric chloride and sodium carbonate, allowing to stand for some time, extracting successively with fresh portions of ether, and shaking the mixed ethereal solutions with a small quantity of water, acidulated with acetic, sulphuric or hydrochloric acid, when the emetia goes into an acid solution, which after the addition of soda in excess is boiled successively with petroleum benzin, etc., as in the first method. The best kinds of ipecacuanha yield from three-quarters to one per cent. of pure emetia; inferior kinds only one-quarter or one-half per cent.

II. PROPERTIES:—Pure emetia, thus prepared, is readily soluble in cold ether, chloroform, acetic ether, amylic, methylic and ethylic alcohol, carbon bisulphide, in ordinary alcohol of any strength, oil of turpentine, volatile oils, and, to a great extent, in olive oil, other fats, and in oleic acid; it is scarcely soluble in cold, readily in hot petroleum benzin, and is still less soluble in cold water, 1,000 parts of which very slowly dissolve but 1 part emetia. From ether, petroleum naphtha, fatty oils and from similar liquids, which are scarcely or not at all soluble in water, it is separated by acids. Its taste and that of its compounds is very bitter. When exposed to light and air it soon turns yellow, but it remains white when protected from the light. On very slowly evaporating its solutions in ether or alcohol, emetia is deposited in thin agglutinating scales, but if the solutions are rapidly evaporated, it is separated in fine uniform granules. It melts at 62° to 65°C. , has a strong alkaline reaction, and is neutralized by acids forming salts, which on evaporation in vacuo form brilliant colorless irregular crystals; when evaporated in the air the salts remain as a dry yellow resin like

mass. The salts are readily soluble in water, alcohol and fatty oils, and are insoluble in ether, petroleum naphtha, benzol, etc. With tannic acid emetia forms an amorphous white pulverulent precipitate, almost insoluble in water; its compounds with gallic and other acids are readily soluble in water. All salts soon become yellow when exposed to light, except the tannate, which remains unaltered. When treated with concentrated sulphuric (nitric? EDIT.) acid, emetia yields oxalic acid, as has been observed by former authors; when treated with dilute sulphuric acid in a closed tube for three hours at 150°C. it is transformed partially into a blackish brown, not bitter, substance, and partially remains unaltered. With all reagents for alkaloids emetia yields amorphous precipitates. Concentrated sulphuric acid, poured on pure emetia does not alter it. One drop of a freshly prepared solution of sodium phosphomolybdate in concentrated sulphuric acid, when added to a small particle of emetia, colors it brown; this color is immediately changed to an intense indigo color on the addition of one drop of concentrated hydrochloric acid.

OSTRICH AND OTHER PEPSINS.

BY I. R. JAMES.

At a meeting of the School of Pharmacy Students' Association (London), held Feb. 12, the author read a paper on the above subject, in which he alluded to the attention attracted by the pepsin obtained from the stomach of the South American ostrich, *Rhea americana* and *Rhea Darwinii*. After giving a brief history of these birds the author refers to ingluvin prepared from the gizzard of the chicken, and which has been said to be superior to pepsin as a remedy for feeble, painful and imperfect digestion. Obtaining some of this preparation from the agents, the following experiments were made:

Fresh eggs were kept in boiling water for one hour and then allowed to get quite cold; after depriving them of their shells the whites were cut into the thinnest possible slices—not minced, as it is easier to observe the progress of the digestion of albumen if it be sliced than if it be minced—and care was taken to reject any portion of yolk. Fifty grains of coagulated albumen thus prepared was placed in each wide-mouthed bottle and covered with 5 drachms of distilled water containing 1 per cent. of hydrochloric acid, sp. gr. 1.16. The quantity of pepsin was then weighed out and added to the mixture of albumen and

dilute hydrochloric acid. The bottles and their contents were then placed in a water-bath and kept at a temperature of 98° to 102°F. for four hours, when digestion was regarded as complete.

Kind of pepsin employed.	Weight of pepsin employed.	Results.
Pig pepsin, . . .	$\frac{1}{2}$ grain . . .	Digested
Ostrich pepsin, . . .	$2\frac{1}{2}$ grains . . .	Not digested.
" " . . .	5 " . . .	" "
" " . . .	10 ¹ " . . .	" "
Ingluvin, . . .	$2\frac{1}{2}$ " . . .	" "
" " . . .	5 " . . .	" "
" " . . .	10 ¹ " . . .	" "

From the results detailed in the foregoing table, and contained in the bottles shown, it will be seen that the albumen is scarcely acted upon at all, and that both ostrich pepsin and ingluvin are practically destitute of the power of digestion.

We know how dominant ideas exercise a powerful effect on the bodily functions. Dr. Carpenter says, "A strong direction of the inward consciousness to any part, especially if attended with an expectation of something being about to happen, is quite sufficient to change the physical action of a part." If the South American Indians' imagination were similarly appealed to, it might be they would derive the extraordinary benefit attributed to ostrich pepsin after partaking of 7 or 8 pounds of beef, which, on the authority of Dr. Symes, they are in the habit of indulging in.

We have heard of late a great deal about elevating the position of pharmacists and chemists and druggists generally. As a step in this direction, and believing as I do that the examination of new remedies is a duty which we owe to medical men, I would suggest that we pay more attention to the testing of substances purporting to be remedial agents which from time to time find their way into our pharmacies and are prominently brought before the notice of practitioners; for it is a matter of considerable importance that the accuracy of facts be well sustained before they are given to the profession, many of whom have no facilities for verifying them. If any of you wish to work in this direction, lest you should think, after excluding the above-named winged animals, that pepsin can only be obtained from the stomachs of pigs, calves and sheep, I have much pleasure in placing before you other kinds. I am indebted to Mr. Lloyd Bullock for the samples of

Finding that twenty times as much ostrich pepsin and ingluvin had so little effect, I did not think it necessary to pursue the experiments further.

pepsins shown, which I have found to possess considerable digestive activity, although inferior in this respect to the pepsin of the pig. One of the specimens is unique of its kind, viz.: pepsin from a human stomach, which I need hardly say is not intended for medicinal use.

In the stomach of the river crayfish is found a plentiful supply of a yellowish-brown, feebly acid juice, which possesses an energetic fermenting power and rapidly dissolves fibrin, but the addition of a few drops of a dilute hydrochloric acid solution stops the action. Also, a somewhat similar ferment to pepsin, discovered by Fick and Murisier in the stomachs of frogs, pikes and trout, differs from it (pepsin) in being more active at a low temperature, as at 20°F., while it loses its digestive power at the temperature of the blood (96° to 98°F.)—*Phar. Jour. and Trans.*, Feb. 21, 1880, p. 662.

A METHOD for the PROXIMATE ANALYSIS of PLANTS.

BY HENRY B. PARSONS.¹

At the request of my friend and former instructor, Prof. Albert B. Prescott, of the University of Michigan, I have prepared the following scheme for the analysis of plants. This method will appear in substance in his new "Proximate Organic Analysis," now nearly completed.

The plan submitted is the outgrowth of a quite varied experience in the proximate analysis of plants; no claim to originality is made, the sole aim being to arrange in one simple scheme those methods best suited to insure accuracy.

It must be premised that no one method is applicable in all cases, and that the operator will so modify and adapt the proposed processes as to best attain the truths he seeks. If the present scheme shall serve merely as an example, to be improved upon as discoveries multiply, it will at least have served to stimulate to the more thorough study, this side the Atlantic, of a much neglected, yet very important, branch of analysis. The American student, when first entering upon the study of plant analysis, is perplexed and disheartened, owing to the lack of any elementary treatise in which he may find directions for the quantitative estimation of the various plant constituents. The works of Rochleder and Wittstein, while giving most valuable assistance in the investigation of special constituents and their separation from large quantities of the crude herb, still fail to give clear and practicable directions for the quantitative estimation of each constituent. Von Mueller's latest enlarged edition of Wittstein's "Plant Analysis" gives a scheme, most excellent in many respects, yet cumbered with tiresome methods of extraction and manipulation, which serve to unnecessarily lengthen the time required for making the analyses without increasing the accuracy of results obtained.

Too many American analyses of plants have been summarized thus: "The plant contains gum, resin, tannin, a volatile oil and a peculiar bitter principle, to which may be ascribed its medicinal activity." The foreign journals bring occasionally

¹ Reprint from "American Chemical Journal," vol. I, No. 6. Communicated by the author.

most excellent examples of accurate examinations of vegetable substances; as instances may be cited, the examination of ginger, by J. C. Thresh,¹ and of ergot,² aloes,³ and other articles by Prof. Dragendorff. To these sources the student must look for his best models until a more thorough and systematic training is given American students in proximate organic analysis.

In following the plan now presented, the use of the apparatus for repercolation is strongly urged for the extractions with benzol, alcohol and other volatile solvents. A very simple and inexpensive apparatus has been described by various American and foreign chemists.⁴

"In any convenient water-tight vessel is a worm of block-tin pipe, having an internal diameter of 9 mm., and a length of about 2.5 meters. The lower (external) part of this worm is fitted by an ether soaked velvet cork to a glass percolator, having a diameter of 4 cm., a length of 20 cm. to the constriction, and 5 cm. below. Within this percolator is a smaller tube, flanged at the top and bottom, and suspended by fine platinum or copper wires. This tube has a diameter of 2.5 to 2.8 cm., and a length of 14 cm.; the bottom is covered by filter paper and fine washed linen,⁵ tied on by linen thread. The weighed sample of the finely powdered herb is placed within this tube for extraction. A light glass flask, weighing about 30 grams, is fitted by an ether-soaked cork to the outer percolator." Having introduced the solvent into this glass flask the connections are made secure, and heat is applied by a water-bath to the flask. If the liquid is too slowly volatilized the addition of a little common salt to the water in the bath serves to remove the trouble.

Next in importance is the use of a good tared filter. The form originally presented by F. A. Gooch⁶ leaves little to be desired. It may be made by perforating with fine holes the bottom of an ordinary platinum crucible, and fitting it accurately to a perforation made in a large rubber cork; this cork connects it with a receiving vessel, which in turn is connected with a Bunsen's pump. Fine asbestos suspended in water is poured into the crucible, the air exhausted from the receiving vessel, and thus a firm, thin layer of asbestos is deposited on the bottom of the crucible. After ignition and weighing the crucible is ready for the reception of any precipitate which it is desired to separate and weigh.

The use of these two pieces of apparatus will eliminate two grave sources of error, viz., incomplete extraction of soluble matters, and inaccuracies introduced by the use of tared paper filters.

The other necessary apparatus is simple, and includes one or more platinum crucibles and evaporating dishes, accurate burettes and graduated cylinders, a good

¹ "Phar. Jour. Trans." [3], 10, 81, Aug., 1879. "Am. Jour. Phar.," 1879, p. 519.

² "Phar. Jour. Trans." [3], 6, 1001, June 17, 1876. "Am. Jour. Phar.," 1876, p. 413; 1878, p. 335.

³ "Werthbestimmung," 1874, p. 110.

⁴ B. Tollens, "Zeitsch. f. Anal. Chem." [17], 320, 1878; "New Remedies" [7], 335, Nov., 1878; W. O. Attwater, "Proc. Am. Chem. Soc." [2], 2, p. 85; S. W. Johnson, "Am. Jour. Sci. Arts" [13], 196; H. B. Parsons, "New Remedies" [8], 293, Oct., 1879.

⁵ In place of the linen and filter paper may be substituted fine brass or platinum wire gauze. Asbestos suspended in water may then be poured in to form a fine felt. The tube can then be dried and weighed, and the amounts extracted may be found by the loss of weight of the tube and substance. A little experimentation will show the operator how to prepare and use the tube. It is but an adaptation of the Gooch's Filter here recommended.

⁶ "Proc. Amer. Acad. Sci." [13], p. 342, 1878; "New Remedies" [7], p. 200, Oct., 1878; "Am. Chem. Journ.," p. 1, 317.

balance, sensitive to at least 5 milligram, and the ordinary glass and porcelain-ware found in all laboratories.

It is assumed that whoever attempts the analysis of a plant is informed as to the normal constituents to be sought, that he has had considerable experience in inorganic analysis, and in the identification of the principal classes of proximate constituents, which he now undertakes to estimate quantitatively. Accordingly, tests for identification will not be here presented; they should, however, never be omitted. The necessity of recording in detail all physical and chemical peculiarities with every weight that is taken is self-evident.

A METHOD FOR THE PROXIMATE ANALYSIS OF PLANTS.

I. Preparation of Sample.

The air-dry specimen should be carefully examined, and all extraneous substances removed. The entire sample should then be ground, or beaten in an iron mortar, until it will all pass through a sieve having from 40 to 60 meshes to the linear inch. After thoroughly mixing this sample, take of it about 100 grams, which should be further pulverized until it will all pass through a sieve having from 80 to 100 meshes to the linear inch. From this smaller portion remove all iron, derived from mill or mortar, by use of a magnet. Then place in a clean, dry bottle, which should be labeled and securely corked. This small sample is for the analysis; the larger portion should be reserved for the separation of those proximate principles which seem, from the analysis, to be worthy of more extended investigation.

II. Estimation of Moisture.

Dry rapidly, at 100 to 120°C., two or more grams of the sample; the loss of weight equals moisture and occasionally a little volatile oil. In some cases it is best to dry at a lower temperature, and at other times the drying should be conducted in a stream of hydrogen or carbonic anhydride.

III. Estimation of Ash.

In a weighed crucible gently ignite two or more grams of the sample until nearly or quite free from carbonaceous matter; the heat should not be permitted to rise above faint redness, or loss of alkaline chlorides may occur. Weigh this residue as *crude ash*, and in it determine:

a. Amount Soluble in Water.—This portion may contain chlorides, sulphates, phosphates and carbonates of potassium and sodium; also slight amounts of chlorides and sulphates of calcium and magnesium.

b. Insoluble in Water; Soluble in Dilute Hydrochloric Acid.—The residue from *a* should be treated with a slight excess of hydrochloric acid, and evaporated in a porcelain dish over a water bath until all free acid has been expelled; it should then be again moistened with hydrochloric acid, water added, and be filtered from any remaining insoluble substances. This treatment removes carbonates (with decomposition) and phosphates of calcium and magnesium, sulphate of calcium and oxides of iron and manganese.

c. Insoluble in Water; Insoluble in Dilute Hydrochloric Acid; Soluble in concentrated Sodic Hydrate.—Boil the residue from *b* with a solution containing about twenty per cent. of sodic hydrate. This treatment removes combined silica of the ash. The residue still insoluble is sand and clay which adhered to the specimen; this residue should be separated, washed thoroughly, and weighed.

Always determine the amounts removed by the above treatment by weighing the dried, undissolved residues. The ash, as thus estimated, usually includes a little unconsumed carbon, together with more or less carbonic anhydride (CO_2), most, or all, of which was not originally present in the plant, but was produced by the combustion of the organic matter. For most purposes it is unnecessary to estimate and exclude from the ash this carbonic anhydride; where great accuracy is desired, a complete quantitative analysis should be made, the amount of each base and acid being determined, and in the statement of results only those should be included which existed originally in the plant. For this purpose it is necessary to burn from twenty to one hundred grams of the sample; for further directions consult textbooks on agricultural and inorganic analysis.

IV. Estimation of Total Nitrogen.

In half a gram or more of the sample determine total nitrogen by combustion with excess of soda-lime, as directed by Prof. S. W. Johnson and E. H. Jenkins. If later in the analysis no other nitrogenous substances are discovered, calculate the total amount of nitrogen to albuminoids by multiplying by 6.25. When other nitrogenous compounds are present, their content of nitrogen should be determined directly or by difference; after proper deductions have been made, the remaining nitrogen should be calculated to albuminoids.

V. Estimation of Benzol Extract.

In a suitable apparatus for repercolation completely exhaust five grams of the sample with pure coal-tar benzol (sp. gr. 85—88, boils at 80 to 85°C., leaves no residue when evaporated). The extraction requires from four to six hours' continued action of the solvent. Carefully evaporate this liquid to dryness in a weighed dish, and record its weight as *total benzol extract*. This extract may contain volatile oils and other aromatic compounds, resins, camphors, volatile or non-volatile organic acids, wax, solid fats, fixed oils, chlorophyll, other colors, volatile or fixed alkaloids, glucosides, almost no ash.

To the weighed extract add water, again evaporate on the water-bath, and complete the drying in an air-bath at 110°C. In absence of other vaporizable substances the loss of weight approximates the amount of *volatile oil*. If the presence of a volatile alkaloid is suspected (from a characteristic odor or an alkaline reaction), add a drop of hydrochloric acid to prevent its volatilization. Camphors are partially dissipated by this treatment; hence, when they are present, this evaporation should be dispensed with.

Treat, now, the residue with a moderate amount of warm water, allow to stand until cool, then filter through fine paper by aid of a Bunsen's pump. In half of the aqueous filtrate determine *total organic matter* and *ash*; test the remaining half for *alkaloids*, *glucosides* and *organic acids* by salts of lead, silver, barium and calcium. Care must be taken not to mistake a slight amount of suspended matter, frequently resinous, for other substances actually soluble in water.

The still undissolved residue should be again removed from filters and dishes by solution in benzole, the benzole solution being again evaporated to dryness. Treat this residue with warm, very dilute hydrochloric acid, allow to cool, and filter

¹ "Report Conn. Agric. Exp. Station," 1878; "Chem. News," July 18, 1879, p. 28; "Amer. Chem. Journal," 1, p. 77.

through paper. The filtrate should be tested for *alkaloids* and *glucosides*. The amount extracted by acid, if any, may be determined by weighing the still undissolved residue. Treat this residue with several considerable portions of eighty per cent. alcohol (sp. gr. '8483 at 15° C.), allowing at least an hour for each treatment. Filter through paper and determine by evaporation the matter dissolved; this usually consists of *chlorophyll* with one or more *resins*, which may sometimes be separated by use of petroleum naphtha, chloroform or similar solvents. Purified animal charcoal removes *chlorophyll* and *some resins* from alcoholic solution, while certain other resins are not removed. If *camphors* were present in the plant, the greater portion will be found in the alcoholic liquid.

The substances undissolved by eighty per cent. alcohol may be *fixed oil, solid fat, wax*, and very rarely a *resin*: their separation may be attempted by refrigeration and pressure, or by use of ether, chloroform, etc.

Recapitulation.

1. Loss by evaporation, with precautions : *volatile oil*.
2. Soluble in water : *alkaloids, glucosides, organic acids*.
3. { Insoluble in water.
Soluble in dilute acids. } : *Alkaloids, possibly glucosides.*
4. { Insoluble in water;
Insoluble in acids.
Soluble in 80 per cent. alcohol. } : a. { Removed by animal charcoal:
chlorophyll, some resins.
b. { Not removed by animal char-
coal : *some resins.*
5. { Insoluble in water.
Insoluble in dilute acids.
Insoluble in 80 per cent alcohol. } : *wax, fats, fixed oils.*

It is frequently advantageous to extract the plant with petroleum naphtha (sp. gr. .66 to .70, boils at about 50°C., wholly volatile) before treatment with benzol; by reference to the accompanying table of comparative solubilities it will be seen that this treatment may serve to separate fixed and volatile oils, and some resins and colors, from certain solid fats, wax, other resins and colors.

Where benzol of sufficient purity cannot be had, pure chloroform is the best substitute. The use of ether is objectionable in this place, as its solvent properties are less distinctly marked than are those of naphtha, chloroform and benzol; in other words, more plant constituents are sparingly soluble in ether than in the above mentioned solvents. Consequently many substances which should properly be extracted by 80 per cent. alcohol will be sparingly dissolved if ether were used, while benzol, chloroform and naphtha would have no perceptible solvent action upon them; tannic acids may be cited as instances illustrating this point.

VI. Estimation of eighty per cent. Alcohol Extract.

That part of the plant not dissolved by benzol should be dried at 100°C., and then completely exhausted by 80 per cent. alcohol (sp. gr. '8483 at 15.6°C.). This requires from 12 to 14 hours' continuous treatment with the solvent. Remove, dry, and weigh any crystals or powder that may separate upon concentrating and cooling the alcoholic percolate. Make the clear liquid to a definite volume by adding more 80 per cent. alcohol. In an aliquot part of this liquid determine *total organic matter* and *ash*; in another equal portion determine *total organic matter* and *ash soluble in water*, and, by difference, *total organic matter insoluble in water*.

The remaining clear alcoholic liquid should be evaporated carefully to dryness.

TABLE OF COMPARATIVE SOLUBILITIES.

Substances.	Water.	Absolute Alcohol.	80 per ct. Alcohol.	Ab. Ether.	Chloroform.	Benzol.	Pet. Naph.	Ammonia, to per ct.	Ammonic Cupric Oxide.	H ₂ SO ₄ , Sp. gr. 1.78.	Fehling's Sol.	Lead Subacetate.
Volatile oils,	Sp	Sol	Sol	Sol	Sol	Sol	Sol	Sol	.	.	.	.
Fixed oils,	Ins	Ins?	Ins	Sol	Sol	Sol	Sol?	Sol?	.	.	.	.
Wax,	Ins	Sp	Sp	Sp	Sp	Sol	Sp?	Ins?	.	.	.	.
Solid fats,	Ins	Sp	Sp	Sp?	Sp?	Sol?	Sp?	Ins?	.	.	.	.
Chlorophyll,	Ins	Sol	Sol	Sol	Sol	Sol	Sp	Ins	.	.	.	.
Soft resins,	Ins	Sol	Sol	Sol	Sol	Sol	Sol	Ins?	.	.	.	.
Hard resins,	Ins	Sol?	Sol	Sol?	Sol?	Sol?	Sol?	Sol?	.	.	.	.
Glucose,	Sol	Ins	Sp	Ins	Ins	Ins	Ins	Sol	.	.	Reduced	Not prec
Sucrose,	Sol	Ins	Sp	Ins	Ins	Ins	Ins	Sol	.	.	Not reduced ²	Not prec
Tannin,	Sol	Sol	Sol	Sp	Ins	Ins	Ins	Sol	.	.	Reduced ²	Prec
Glucosides,	Sol?	Sol?	Sol?	Sol?	Sol?	Sol?	Sol?	Sol?	.	.	Reduced ²	Not prec
Alkaloids,	Sol?	Sol?	Sol?	Sol?	Sol?	Sol?	Sol?	Sol?	.	.	.	Not prec
Albuminoids,	Sol?	Sol?	Sol?	Ins	Ins	Ins	Ins	Ins?	.	.	Not reduced	Prec
Gums,	Sol	Ins	Ins	Ins	Ins	Ins	Ins	Sol?	.	.	.	Prec
Pectin,	Sol	Ins	Ins	Ins	Ins	Ins	Ins	Sol?	.	.	.	Prec
Pectic acid,	Ins	Ins	Ins	Ins	Ins	Ins	Ins	Sol?	.	.	.	Prec
Organic acids,	Sol?	Sol?	Sol	Ins?	Ins?	Ins?	Ins?	Sol	.	.	.	Prec
Salts of org. acids,	Sol?	Sol?	Sol?	Ins?	Ins?	Ins?	Ins?	Sol?	.	.	.	Prec?
Starch,	Ins	Ins	Ins	Ins	Ins	Ins	Ins	Ins	.	.	.	Prec?
Cellulose,	Ins	Ins	Ins	Ins	Ins	Ins	Ins	Ins	Sol	Sol	.	.
"Para cellulose,"	Ins	Ins	Ins	Ins	Ins	Ins	Ins	Ins	Ins ¹	Sol	.	.
"Meta cellulose,"	Ins	Ins	Ins	Ins	Ins	Ins	Ins	Ins	Ins	Sol	.	.
"Vasculose,"	Ins	Ins	Ins	Ins	Ins	Ins	Ins	Ins	Ins	Sol	.	.
"Extractives,"	Sol	Ins?	Sol?	Ins	Ins	Ins	Ins	Sol?	.	.	Reduced?	Not prec?
Colors,	Sol?	Ins?	Sol?	Ins	Ins	Ins	Ins	Sol?	.	.	.	Prec?

¹ Para cellulose "soluble in ammonia-cupric oxide after boiling with dilute HCl.

² Glucosides reduce Fehling's solution after boiling with dilute acids; same with sucrose.

An? show that some marked variations or exceptions occur.

Sp = sparingly soluble, Sol = soluble, Ins = insoluble.

pulverized and treated with several considerable portions of absolute alcohol (sp. gr. .7938 at 15°C.).

A. SOLUBLE IN ABSOLUTE ALCOHOL.

a. Soluble in water.

a¹. Precipitated by subacetate of lead.

Tannin and most organic acids; some extractives; some inorganic acids of the ash. Weigh in Gooch's filter, ignite cautiously, and again weigh; loss equals organic matter precipitated.

a². Not precipitated by subacetate of lead.

Alkaloids, glucosides, some extractives and colors. Determine by difference between *a* and *a¹*.

b. Insoluble in water.

b¹. Soluble in dilute hydrochloric acid.

Alkaloids, glucosides (rarely), some extractives. Determine by difference between *b* and *b¹*.

b². Insoluble in dilute hydrochloric acid.

b³. Soluble in dilute ammonic hydrate.

Most acid resins, some colors. Determine by difference between *b²* and *b⁴*.

b⁴. Insoluble in dilute ammonic hydrate.

Neutral resins, some colors, albuminoids (in some seeds). Re-dissolve in alcohol, evaporate and weigh.

B. INSOLUBLE IN ABSOLUTE ALCOHOL.

c. Soluble in water.

c¹. Precipitated by subacetate of lead.

Some colors, extractives, albuminoids (rarely), organic acids, and inorganic acids of the ash. Weigh in Gooch's filter, ignite cautiously, and again weigh; loss equals organic matter precipitated.

c². Not precipitated by subacetate of lead.

Alkaloids, glucosides, glucose, sucrose, some extractives. Determine by difference between *c* and *c¹*. Remove Pb by H₂S, H₂SO₄, Na₂CO₃, or other means, and titrate for sucrose and glucose.

d. Insoluble in water.

d¹. Soluble in dilute hydrochloric acid.

Some alkaloids and glucosides. Determine by difference between *d* and *d¹*.

d². Insoluble in dilute hydrochloric acid.

Few resins, some extractives and color substances. Dissolve in alcohol, evaporate and weigh in a tared dish.

In some cases it may be preferable to use the following method for analysis of the 80 per cent. alcohol extract; it is more desirable when the plant examined contains a considerable amount of sugars, tannic acid, etc.

Alcohol Extract, dilute to 200 cc. with 80 per cent. alcohol.

1. In 20 cc. determine *total organic matter* and *ash*.

2. In 20 cc. determine *total organic matter* and *ash* that are *soluble in water*, and, by difference, *total organic matter insoluble in water*.

3. Evaporate the remaining 160 cc. to dryness, treat with water, filter, and make the filtrate measure 160 cc. Reserve the insoluble matter on the filter for examination (10).

4. In 20 cc. of the aqueous solution determine tannin gravimetrically by A. Carpeni's method;¹ precipitate by ammoniacal acetate of zinc, use a Gooch's filter, wash the precipitate with very weak ammonia, dry at 120°C., weigh, ignite cautiously, again weigh. The loss by ignition equals tannic acid, in absence of certain interfering substances.

5. Precipitate 20 cc. by normal acetate of lead, and determine, as before described, the amount of organic matter after drying at 100 to 120°C. This precipitate will contain, if the substances are present in the plant, *tannic, gallic*, and most other *organic acids*, some *colors*, rarely *albuminous substances*, some *extractives*, and most *inorganic acids* of the ash. Determine, by difference, the amount not precipitated by this treatment.

6. In 20 cc. determine in like manner the amount precipitated by basic acetate ("subacetate") of lead. This reagent precipitates a greater number of acids, colors and extractives than are precipitated by the normal acetate, hence it is frequently possible to estimate such substances by subtracting the amount precipitated by one reagent from the amount precipitated by the other. To the filtrate add a slight excess of dilute hydrochloric acid, boil gently for half an hour, and determine in the liquid *total glucose* by use of Fehling's solution.

7. Precipitate 20 cc. by subacetate, exactly as in 6, and use the precipitate as a duplicate to check the amount there estimated. To the filtrate add a very slight excess of solution of carbonate of sodium, filter from the carbonate of lead, wash well with water containing a little alcohol, and in the filtrate estimate *actual glucose*. If the glucose thus found is appreciably less than that in 6, subtract it from that amount; this glucose may be due to the presence in the plant of *sucrose* or some *glucoside*. If due to sucrose, the amount of the latter may be found by multiplying this residual glucose by .95; if to a glucoside, a fit subject for an extended investigation is presented. The properties, formula and decomposition products of the newly-found glucoside should be carefully studied.

8. Precipitate 20 cc. with subacetate of lead, as in 6 and 7, employing the precipitate as material from which to separate organic acids, after removal of lead by sulphuretted hydrogen. Acidulate the filtrate with sulphuric acid, add an equal volume of alcohol, allow to stand two hours, filter, wash the precipitate with 50 per cent. alcohol, and evaporate the filtrate until all alcohol has been dissipated. Test the acid solution for *alkaloids, glucosides, sugars, extractives*.

9. Reserve the remaining 40 cc. for duplicating any unsatisfactory determinations.

10. The residue mentioned in 3 as insoluble in water may contain *resins, albuminoids* (especially from seeds), *colors, alkaloids, glucosides*. Dilute acids remove *alkaloids* and some *glucosides*; dilute ammoniac hydrate will remove some *resins, colors* and *glucosides*. Any still insoluble residue probably contains *albuminous* or *resinous* substances.

VII. Estimation of Cold Water Extract.

That part of the plant remaining insoluble after treatment with alcohol should be dried at 110°C., and completely extracted by cold water. When the plant contains considerable mucilaginous matter this is best removed by placing the sub-

¹"Chem. News," July 9, 1875, p. 19, from "Gaz. Chim. Ital.," 1875, No. 3; "Proc. Am. Ph. Assn.," 1875, p. 341. See also "Amer. Jour. Phar.," 1876, p. 219.

stance in a flask or graduated cylinder, and then adding a measured volume of cold water. Allow to macerate, with frequent agitation, for from 6 to 12 hours, then filter through fine washed linen, and evaporate an aliquot portion of the solution. In this residue determine *total organic matter* and *ash*. This residue usually contains little but *gum*; in analysis of fruits and fleshy roots *pectin bodies*, *salts of organic acids*, rarely a substance resembling *dextrin*, and small amounts of *albuminous substances* and *coloring matter*. Usually the separation of these substances is very difficult. The unevaporated liquid should be used for such qualitative reactions as are necessary to show the nature of the substances extracted. The insoluble residue should be well washed with water, transferred to a crucible, and completely dried at 110°C . This residue should be then weighed.

VIII. Estimation of Acid Extracts.

The dried residue insoluble in cold water should be transferred to a beaker containing 500 cc. of water and 5 cc. of concentrated sulphuric acid (sp. gr. 1.84). Boil for 6 hours, on a gauze support, adding water to keep the volume of liquid unchanged; if the substance be very starchy a longer boiling may be necessary. This treatment will convert *starch* and its *amorphous isomers* to dextro glucose, and will occasionally remove some *salt of an organic acid*, with usually traces of *albuminous* and *indeterminate* substances.

The *total amount extracted* may be found by washing, drying at 110°C ., and weighing the yet insoluble residue, and subtracting the weight from the one taken after extracting with cold water. The amount of *starch and isomers* may be found by determining in a given volume of the acid filtrate the amount of *glucose*, using Fehling's solution; the glucose thus found multiplied by .9 equals *starch and isomers*. The *total extract* minus *starch and isomers* equals *acid extract not starch*. This includes a small amount of *ash*, which may be approximately determined by evaporating and igniting a known volume of the solution.

Where it is wished to separate the extracted matter from the sulphuric acid, boil the liquid with an excess of powdered barium carbonate until no acid reaction remains. Filter and evaporate to dryness. The residue consists chiefly of hydrated dextro glucose ($\text{C}_6\text{H}_{12}\text{O}_6 \cdot \text{H}_2\text{O}$), with some ash.

IX. Estimation of Alkali Extract.

Wash well and dry at 110°C . the residue from treatment with acid, and record its weight. Boil this residue for two hours with 500 cc. of a solution containing 20 grams of sodic hydrate to the liter. Filter through fine washed linen, and wash the residue thoroughly with hot water, alcohol and ether. Transfer it to a weighed crucible, dry at 110 to 120°C ., and weigh the residue as *crude fibre* and *ash*; this weight subtracted from the previous one shows the *total alkali extract*. This extract is largely *albuminous matter* and various modifications of *pectic acid*, Fremy's "*cutose*," and various *coloring*, *humus* and *decomposition compounds* in small amounts. Most of the extracted substances may be precipitated by excess of an acid with or without the presence of alcohol.

X. Cellulose.

The crude fibre from IX should be treated with from 50 to 100 c. c. of U. S. P solution of chlorinated soda and allowed to stand twenty-four hours. If not then bleached white, slightly acidulate with hydrochloric acid and set aside for another

day. Filter through fine linen, or Gooch's filter, wash with hot water, dry at 110 to 120°C., and weigh, ash free, as *cellulose*. The loss of weight by this treatment state as *lignose* and *color*.

Remarks.

It is advisable to determine always, in addition to what has already been directed, the amounts extracted directly from the sample by water, ether, alcohol of various percentages, methylic alcohol, naphtha, chloroform, carbon disulphide, etc. In each extract estimate *total organic matter* and *ash*, determine qualitatively, and quantitatively when possible, its constituents, by treating with such solvents and reagents as are indicated. Each extract being composed of certain distinct substances, it is necessary to account for them in every case.

The amounts present of some constituents may be found by subtracting the weight extracted by some one solvent from the weight extracted by some other. It will be seen that this is a method of limited applicability, which can only be applied in those cases where the difference between the solvent action of the two liquids is very sharply defined. Certain special methods for the estimation of single constituents may be used, care being taken that all interfering substances be first removed. The methods of preparation of known substances as given in Husemann's "Pflanzenstoffe," and to a considerable extent in Watt's Dictionary, may serve as suggestions for work. Treatment with benzol, eighty per cent. alcohol, and water, removes from nearly all plants the constituents of greatest chemical and medicinal interest, but in analyses of grains, fodder and food materials those compounds extracted by dilute acids and alkalies have great value. There are substances in plants, seemingly isomers of starch and cellulose, which have properties more or less resembling those of cellulose, and are changed by boiling with dilute acids to glucose. In absence of an established nomenclature it has seemed best to use the terms "starch isomers," or "amylaceous cellulose" for these substances,¹ while those constituents, *not albuminous*, which are removed by dilute alkali have been termed "alkali extract." These substances have been investigated by various chemists, but no definite and authoritative nomenclature has yet been adopted. Thomsen gives the name "holz-gummi," *wood gum*, to a white substance extracted from plants by dilute sodic hydrate, while Fremy regards these various compounds as modifications of pectic acid, pectin, and "cellulose bodies."² Starch also may exist in some seeds (as of sweet corn) in a form soluble in water.⁴

It will be seen that the field for investigation is limitless, and almost unoccupied as yet, and that there is great need for improved methods for proximate analysis. The analyst will find that a study of any common plant will require of him much more than unthinking, mechanical habits of manipulation, while every careful investigation will reveal to him some constituents deserving more full and accurate study.

¹ U. S. Dept. of Agric. Report, 1878, p. 189.

² Kolbe's "Jour. prak. Chem." Band 19, p. 146.

³ "Compt. Rend," lxxiii, 1136; "Jour. Chem. Soc." 1877, p. 229.

⁴ U. S. Dept. of Agric. Report, 1878, pp. 153-155.

VARIETIES.

Poison for Rats and Mice.—A mixture of 1 part precipitated barium carbonate, 3 parts barley flour and sufficient water to make a mass, is rolled into pills, having the size of beans. These are said to be fully as efficacious as phosphorus pills, and are decidedly cheaper.—*Pharm. Ztschr. f. Russl.*, 1879, p. 631, from *Drog. Ztg.*

A preparation for poisoning parasites on animals and plants, patented by J. Wilson, is made by melting 50 parts tallow, or another cheaper fat, and 25 parts rosin, adding 50 parts crude soda and 25 parts borax, boiling with water, adding 75 parts carbolic acid and 30 parts calcium sulphide solution, and finally 80 parts extract of tobacco. The inventor thinks that this mixture forms sulphoglycerol-carbolate of nicotin.—*Ber. d. Deutsch. Chem. Ges.*, 1879, p. 2195.

Water Proof Leather.—A preparation for this purpose, patented by J. A. Rosa, of Paris, consists of a solution of ordinary rosin, or another resin, in turpentine, petroleum ether, etc.—*Ibid.*, p. 2194.

Carbolic varnish, suitable for spreading on damp walls, and also on wood, for the purpose of preserving it, is made by dissolving, in an iron kettle, 100 parts borax and 50 parts caustic soda in 4,000 parts water, heating to the boiling point, gradually adding 450 parts shellac, stirring constantly, and, after cooling or when lukewarm, adding 200 parts 90 to 95 per cent. pure carbolic acid. This varnish is applied lukewarm, and is frequently diluted with one-third its bulk of hot water.—*Pharm. Centralb.*, Dec. 11, 1879, p. 463.

An excellent paint for damp walls, highly recommended by D. Johannsen, consists of rosin, boiled linseed oil and oil of turpentine, each 5 parts, and white chalk 15 parts.—*Pharm. Ztg.*, 1879, p. 625.

Sulpho-Methylate of Sodium.—A New Purgative.—M. Rabuteau has investigated a new purgative, analogous to sulpho-vinate of sodium. It is obtained by treating methyl alcohol with sulphuric acid, when methyl-sulphuric acid and water are obtained. This product is neutralized with carbonate of barium, when the excess of sulphuric acid is thrown down in the insoluble form of barium sulphate, and there remains in solution sulpho-methylate of barium, a substance which is very soluble, and which can be crystallized. It is then treated afresh with sulphuric acid, which liberates pure sulpho-methylic acid, which yields sulpho-methylate of sodium when neutralized with soda. The salt is white and very soluble, crystallizing with difficulty, of a feeble taste comparable to that possessed by sulpho-vinate of sodium, with a sweet after-taste. Unfortunately it decomposes very rapidly into sulphate of sodium and methylic products of a slightly garlic-like odor. Ten grams of the salt in 25 cc. of water injected into the veins of a dog produced constipation. Acting upon the observation that the substance when introduced into the blood gave rise to constipa-

tion, M. Rabuteau believed that it should act as a dialytic purgative when given by the mouth. He therefore administered it to two patients; in one case a woman took 15 grams in two doses, when it produced three stools, of which two were copious in the second a man took 18 grams, resulting in two stools without colic. The taste of the purgative is hardly perceptible, but it is difficult to preserve it.—*Chicago Med. Jour. and Exam.*, March, 1880.

Thymolin Soap is a soap designed especially for the antiseptic cleansing of physicians' instruments. The soap contains a sufficient quantity of the disinfectant, and the odor of the thymolin is by no means unpleasant. In this day when so much is said respecting the transmission of disease by surgical instruments it will be a satisfaction to make use of an agent in cleansing them, which will at least assist in their disinfection.—*Chicago Medical Jour. and Exam.*—*Virginia Med Monthly*, Dec, 1879.

Eucalyptus.—In the Italian Medical Gazette R. Rudolph reports eucalyptus as a specific for acute coryza, and declares that chewing the twigs and swallowing saliva secreted will result in rapid relief. His experience includes experiments upon his patients and upon himself. It is probable that the fluid extract would be equally efficacious.—*Chicago Med. Gazette*, Feb. 20, 1880.

Paper Pulp from Poplar Wood.—The Worcester "Spy" says: It surprises people to see the great logs of poplar wood go through the powerful machine at the Connecticut river pulp mill at Holyoke. The wood as it is brought to the mill is about the size of cord wood used for fuel, and in this shape the machine takes it and gnaws it up very fine. So rapidly does this process go that the machine eats about seven and a half cords of wood a day, and this makes between three and four tons of pulp. After coming from the machine the wood is put into vats and reduced by the action of chemicals. It is used for the manufacture of news and book paper, and pulp made from spruce wood, which has more fibre than poplar, is sometimes used in the cheaper grades of writing paper. Spruce is harder to reduce to pulp than poplar, and but little of it is used. The poplar trees in this vicinity have long since given out, and the wood is now mostly brought from Canada.—*Gaillard's Med. Journ.*, Feb, 1880.

Jamaica Dogwood (*Piscidia erythrina*), is recommended in the "Pharmaceutical Journal" as a powerful narcotic, capable of producing sleep and relieving pain in an extraordinary manner. It has been used as an anodyne in toothache, curing the pain when introduced upon a dossil of cotton into the carious tooth. In Brazil it has an established reputation as a nervous sedative. Its action seems to be over the nerve centers; it causes sleep without producing the cerebral hyperæmia which succeeds opium and the active principles extracted therefrom. The sleep is tranquil and refreshing; it soothes bronchial cough and moderates the paroxysm of asthma and nervous coughs. It has been used with success in chronic hepatitis and obstructions of the liver.

The idiosyncrasies encountered in many cases in regard to the action of opium and its alkaloids compel the profession to seek an anodyne and hypnotic in other agents

We think this remedy worthy of a trial. The fluid extract is used in doses of five drops.—*Buffalo Med. Journ.*—*Nashville Journ. of Med. and Surg.*, Feb., 1880.

Hard versus Soft Water.—Dr. Tidy, the well-known chemist, thus summarizes in the London "Medical Examiner" the results of his observations on the use of hard water for culinary and domestic purposes:

1. Hard water is the best dietetically, because of the lime.
2. It makes better tea, although not so dark colored, owing to the fact that soft water dissolves the bitter extractive matters which color the tea, but ruins the aroma.
3. It relieves thirst, which soft water does not.
4. It does not dissolve lead or organic matter, which soft water does.
5. It is generally good colored, soft water being as a rule dark colored and unpleasant looking; hence in places like Manchester, supplied with soft water, they always put it (in hotels) in dark bottles to hide the color. A soft water, however, is a better detergent and requires less soap. For a residential town a water which has over ten degrees of hardness would be best. For a manufacturing town a soft water would be the most advisable for commercial considerations only.—*Pharmacist.*

A Plea for Oleomargarin as a Food Product.—Representatives of the oleomargarin industry appeared before the House Committee on Agriculture and Manufactures on March 10th, in opposition to any legislation injuriously affecting their product. They claim that oleomargarin is identified with butter; that both the real butter and oleomargarin butter are simply animal fat, and the difference in the process of manufacture makes no difference in the substance. They stated that the factory in New York is now making 40,000 pounds of oleomargarin butter per day, and that there are eleven such factories in Baltimore, Louisville, Chicago and other cities; that the exports of oleomargarin oils from the port of New York alone amounts to 5,000 tierces per month. They protest against any discriminating legislation on the ground that their product is a general food-product, pure and wholesome in itself, and a fit substitute for butter.—*New York Med. Record*, March 20, 1880.

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, March 18th, 1880.

In consequence of the fifty-ninth annual commencement of the College occurring on the third Tuesday of the month, the Pharmaceutical Meeting was postponed to Thursday, the 18th inst.

The meeting was called to order by Dillwyn Parrish, the President; the minutes of the last meeting having been read, were approved.

Donations to the cabinet and library being the first business in order, the Registrar presented and described the advantages of a lozenge apparatus, designed by Mr. Francis E. Harrison, of the graduating class of this year. It will be figured in the May number of the "Journal."

The Registrar presented to the library, on behalf of Mr. George W. Gray, a graduate of the class of 1877-78, a copy of the Pharmacopœia of St. Thomas Hospital, London, dated 1781, for which the College returned their thanks. The recent additions to the library were shown, consisting mainly of serial publications, received in exchange for the "American Journal of Pharmacy," and of several works bearing upon the sciences closely related to pharmacy.

Mr. Gaillard exhibited a very handsome specimen of the sweet cassava root (*Jamipha Manihot*), a native of Brazil, but now acclimated in Florida; when boiled it furnishes a good substitute for the potato; a very beautiful starch can be prepared from it by the usual method, and a very fine article of glucose can be obtained by boiling with dilute sulphuric acid.

Professor Maisch presented to the cabinet and exhibited samples of *soft paraffin*, sold under the name of petrolina and made by the Binghamton oil refining company, of Binghamton, N. Y. It is of a uniform consistence, free from odor, and appears to be composed entirely of paraffins melting at about the same temperature. The thanks of the meeting were returned to the donors for their gift.

Mr. J. U. Lloyd, of Cincinnati, lately sent samples of the root of *Anemopsis Californica*, Hooker, to Professor Maisch, which he exhibited. A singular peculiarity was pointed out, that a number of underground stems, of same species of grass, had completely grown through the root, sometimes transversely, sometimes diagonally and sometimes longitudinally. The root is possessed of a good deal of pungency and yields a large proportion of volatile oil, which gives a blue color with hydrochloric acid, this being the only known volatile oil exhibiting this reaction; several other products of the root, described by Mr. Lloyd in the January number of the "Journal," p. 4-6, accompanied the oil. An investigation of the medical properties of the root is being made.

A specimen of *sclerotic acid* was shown by Professor Maisch; this acid was discovered by Professor Dragendorff and is considered the most efficient principle in ergot; it has been used with considerable success in the hospitals of Russia and Germany.

A number of the *botanical plates*, published by Dr. Dodel-Port, of Zurich, Switzerland, were exhibited by Professor Maisch, who stated that these hand-omely executed plates are admirably adapted for illustrating lectures on botany.

There being no further business, the meeting adjourned.

T. S. WIEGAND, Registrar.

PHARMACEUTICAL COLLEGES AND ASSOCIATIONS.

Philadelphia College of Pharmacy.—The examination of the *Junior Class* was held on the afternoon and evening of February 14th. The following were the questions:

MATERIA MEDICA AND BOTANY.

1. What kind of tissue is called *cork*?
2. Define the nature of *tuber*, and give an example.

3. Explain the character of the *venation* of the leaves of monocotyledons and of dicotyledons.
4. Give the characters of the natural order of *Lobeliaceæ*.
5. Name the official drugs from the natural order of *Gentianaceæ*.

PHARMACY.

1. How many grams are there in an Avoirdupois Ounce, Kilogram, Troy Pound, Fluid Ounce of Water at 60°F, Cubic Centimeter of Water at 4°C?
2. Explain the method of using the most accurate instrument for taking the specific gravity of liquids.
3. Define the following pharmaceutical terms: Extract; Suppository; Ointment; Precipitate; Saturated Solution.
4. Explain briefly the theory of percolation.
5. What is the Pharmaceutical meaning of the following terms: Filtrate; Dialysis; Menstruum; Desiccation; Water-bath.

CHEMISTRY.

1. Describe the barometer. How does it measure the pressure of the atmosphere?
2. Describe the Bunsen battery cell, and state which is the positive and which the negative pole.
3. Write the reaction for the production of Hydrochloric Acid.
4. Mention some of the methods by which Ammonia is produced.
5. Give the formulas and names of the several varieties of Phosphoric Acid.

COMMITTEE.

1. Describe, or illustrate by a diagram, any two of the following forms of leaves: Cordate; Lanceolate; Orbicular; Ovate; Obovate; Peltate.
2. Give the botanical name and natural order of three plants which yield official leaves.
3. What are the physical properties of Bromine? Write its symbol and give its specific gravity. What are its compounds with other elements called?
4. State the source of Sulphur and its symbol. What is a compound of Sulphur with another element called? What occurs when Sulphur is heated in contact with air?
5. State which is the heavier, an Avoirdupois or a Troy ounce, and how much? Also, state the difference, in grains, between an Avoirdupois and a Troy pound, and the number of ounces in each.

Specimens for Recognition.

Mentha piperita,
Lavandula,
Anthemis,
Arnica,

Vinum Ergotæ,
Syr. Pruni Virgin.,
Extract Buchu fluid,

Sulphur præcipitatum,
Acidum Sulphurosum,
Acidum hydrochloricum.

The examination resulted in the passing of the large majority of the students and their admission to the senior course. Those who failed in one or more branches will be granted another examination near the close of September next.

Later on the same evening the Junior Class had a farewell reception at W. H. Shuster's, on which occasion the members of the faculty were present by invitation.

The examination of the *senior students* commenced on Saturday, February 28, one series of questions being given on four consecutive days, and closed on March 4th with the practical exercises.

QUESTIONS IN MATERIA MEDICA AND BOTANY.

A. Give the source of *Rhubarb* as to the plant or plants, natural order and country producing it. Describe the physical and the structural characteristics of the drug. Name a crystallized Salt, and the important organic constituents of *Rhubarb*. What effect have the alkalies upon its liquid preparations? What other official root contains the same characteristic constituents as *Rhubarb*?

B. Give the botanical name, natural order and habitat of the plant yielding *Calamus*. What part is used? Describe its physical properties with the position and arrangement of the rootlets and its structural characteristics, naming the cause of the spongy appearance of fresh *Calamus*. Enumerate its medicinally important constituents, and give its medical properties.

C. What officinal *Rhizomes* are obtained from the order of *Ranunculaceæ*? Give the botanical names of the plants, with their habitat. Describe each drug briefly, and give their medical properties and doses.

D. Give the botanical name, natural order, habitat and part of the plant yielding *Quassia*. Describe the drug, and the behavior to simple solvents of its bitter principle. What is the botanical source of *Surinam Quassia*, and how does this differ from the officinal drug?

E. What is *Prickly Ash*? Give the names, natural order and habitat of the plants yielding the drug; also the commercial varieties, and describe the characteristics of each variety. What are its medical properties and dose?

F. Which officinal *leaves* are *lobed*? Give of each the name, natural order and habitat of the plant. Describe each drug briefly and name the important constituents, medical properties and dose of each.

G. Give the botanical characters of the natural order of *Umbelliferae*. Name the officinal fruits obtained from this order, and state to which sub-order each one belongs, and the number of oil tubes found in each fruit.

H. What is *Calabar Bean*? From which plant, natural order and country is it obtained? Describe the physical properties of the drug and its structure. Name the active constituents, and give the medical properties and the dose of the drug.

I. What is *Copaiba*? Name the plants yielding it, their natural order and native country. Describe briefly the drug and its proximate constituents. State in what respects the principal commercial varieties differ and how adulterations may be recognized.

K. Describe the officinal *Opium*, and give the average amount of moisture contained in, and the amount of aqueous extract yielded by it. How may adulterations with extracts, gums and starches be detected? How much Morphia should dry *Opium* contain? Name some of the other Alkaloids; also, the Acid found in *Opium*, and give a characteristic reaction of the last named principle.

QUESTIONS IN PHARMACY.

A. Write out the answers to the following, showing the method of obtaining the results: How many grams in a liter of Stronger Ether at 4°C.? in a centiliter of Monsel's Solution at 4°C.? in a hectoliter of Creasote at 4°C.? in a pint of Glycerin at 60°F.? in a cubic centimeter of Mercury at 4°C.?

B. Define the following terms used in Pharmacy: Stearopten; Gum Resin; Glucoside; Balsams; Alkaloid; and name one officinal stearopten, three officinal gum resins, two officinal glucosides and five officinal alkaloids.

C. Give the ingredients used in preparing and the officinal names of the following: Soap Cerate; Syrup of Almond; Tincture of American Hellebore (with proportions); Compound Iodine Ointment; Wine of Rhubarb; Fluid Extract of Conium Fruit; Iodide of Ammonium; Yellow Oxide of Mercury; Donovan's Solution; Plummer's Pills.

D. How are Sugars divided into classes, for convenience in studying their chemical properties? Give a prominent example of each class. Give a test to show the identity of each example which you have chosen. What variety of Sugar may be prepared from Starch? From what other sources can this variety be prepared?

E. Name the Acid present in officinal *Vinegar*. From what source is the Commercial Acid obtained? What impurities are usually present in the Acid? How may they be detected? What is the U. S. Pharmacopœia test for its strength? What is the chemical name for *Pyroxylon*? How is it prepared? What are its properties? State how two officinal preparations of it are made. Give the uses of these preparations.

F. Give the ingredients and English names for *Acidum Sulphuricum Aromaticum*,

Confectio Opii, Emplastrum Ammoniaci cum Hydrargyro, Infusum Rosæ Compositum, Liqueur Iodini Compositus, Pilulæ Aloes et Myrrhæ, Spiritus Juniperi Compositus, Syrupus Rheii, Tinctura Cantharidis, Trochisci Sodii Bicarbonatis.

G. Name two official liquids obtained directly from the *Lemon*. What Acid is present in this fruit? How is it prepared? What are the usual impurities? How may they be detected? What other Acid does it closely resemble? What chemical tests serve to distinguish them? What is the quantivalence of each? Name four official preparations of the Acid from Lemons. Name four official preparations of the Acid which it most closely resembles.

H. How is diluted *Hydrocyanic Acid* prepared? What is the standard of strength adopted by the U. S. Pharmacopœia? How may it be preserved? In what official Syrup is it found? Why is it present in this Syrup? What active substance is produced when *Ground Black Mustard Seed* is treated with water? Is the same substance produced when *Yellow Mustard Seeds* are similarly treated? How are Prepared *Sinapisms* or Mustard Leaves usually prepared? What precautions are necessary to keep them? How are they used practically?

I. How is *Pyrophosphate of Iron* prepared? What takes place when its solution is mixed with Diluted Phosphoric Acid in excess? How is Diluted Phosphoric Acid prepared? What is its specific gravity? What are the official tests?

K. Name three official preparations containing *Metallic Mercury*. What is the percentage of Mercury in each? How may the quantities of Metallic Mercury in each be ascertained? Name two official combinations of Iodine with Mercury. State how each is prepared.

QUESTIONS IN CHEMISTRY.

A. What is the official process for preparing Potassium Iodide? Give the two reactions showing the two stages of the process. How may a trace of Iodate remaining be detected? Explain the reaction involved in this test.

B. What is the composition of *Ammonii Carbonas* in the dry state, and what does it become when in solution? Why is Ammonia Water to be added to this solution in preparing Neutral Ammonium Carbonate?

C. What is the difference between *Carbo Animalis* and *Carbo Animalis Purificatus*? Describe the mode of treatment by which the first is converted into the second. How does *Carbo Animalis* differ from *Bone-Asb*, and how is each produced?

D. What are the means of distinguishing between *Ferrous* and *Ferric* Salts? Give the chemical formulas of the several reagents used; also the formulas of the compounds they form with the Ferrous and Ferric Salts, respectively.

E. Describe *Marsh's test* as applied to Arsenic and to Antimony, respectively, and enumerate points of difference in the two cases, giving the tests by which we may decide certainly as to which element is present.

F. How would you test *Calomel* for a trace of *Corrosive Sublimate*, and how would you remove any such trace from the *Calomel*?

G. How is *Ether* made? What precautions are necessary to insure a good yield and a pure product? Give its chemical formula, and state its relationship to Alcohol.

H. Describe *Glycerin*. To what class of organic compounds does it belong? In what naturally occurring compounds is it found, and how are these compounds decomposed? What is formed at the same time that *Glycerin* is liberated?

I. What is the source of Tartaric Acid? Give its formula. Give the formula of *Potassii Tartras*, of *Potassii Bitartras*, of *Potassii et Sodii Tartras*, of *Antimonii et Potassii Tartras*.

K. To what class of organic compounds does *Acidum Tannicum* belong? Whence is it obtained? What are the characteristic reactions of it, as detailed in the Pharmacopœia?

QUESTIONS BY THE EXAMINING COMMITTEE.

A. Give the botanical name of the plant which yields *Seneka*. To what natural order does it belong? Describe briefly the physical and structural characteristics of the Root. What are the chief constituents of *Seneka Root*? State the various names which have been given to the supposed active principle. In which portion of

the Root does the activity reside? What other Roots have usually been found mixed with Seneka as impurities? What entire substitution for Seneka has occurred within a few years? What is the cause of the liquid preparations of Seneka becoming gelatinous? and what will prevent this, or remove it if it has already occurred? Write out in full three official names of preparations of Seneka.

B. Give the official name of *Gamboge*. The botanical name of the plant which yields it. Its natural order. Habitat. How is the drug obtained from the plant? To what principle is the activity due? What are its medical properties? What is the dose for an adult? Name an official preparation into which it enters. What effect has an alkaline solution upon it?

C. Give the official name and parts used medicinally of the following drugs; also the botanical name, natural order and habitat of the plants which furnish them: Camphor, Rhatany, Turpentine, Ipecacuanha, Squill, Galls, Arrow Root, Liquorice, Sago, Arnica.

D. What is *Bromine*? From what source is it obtained? State the mode of its preparation. Write its symbol. Give its specific gravity. What is its quantivalence? Describe its physical properties. Name two of its official compounds. What is its compound with Hydrogen called? Write the formula for this compound.

E. What is the official name of *Epsom Salts*? From what source is it obtained? How is it prepared? Give its general characteristics, and a test of its purity. What is the official name of *Glauber's Salts*? From what source is it obtained? How is it prepared? Give its general characteristics, and a test of its purity. How may these two Salts be distinguished from each other?

F. Give the official names and ingredients of the following preparations (omitting quantities), with the dose of those intended for internal administration: Fowler's Solution, Compound Spirit of Lavender, Antimonial Wine, Paregoric, Soap Liniment.

G. Give the formulas and describe the process of making the following preparations (omitting quantities): *Pilula Ferri Carbonatis*, *Pulvis Aromaticus*, *Liquor Sodæ Chlorinatæ*, *Syrupus Rhei Aromaticus*, *Emplastrum Plumbi*.

H. Give the official name of *Muriate of Ammonia*. Describe its appearance as found in commerce. What is the effect of heat upon it? What effect will be produced by triturating it with Hydrate of Calcium? What impurity is usually present in the commercial article? Name a test which will indicate this impurity in solution. What purified preparation is recognized by the United States Pharmacopœia? Give the mode of its purification (omitting quantities). State the reaction which takes place during the process. What is the appearance of the purified article.

I. Criticise the following prescriptions, in I and K, state how you would prepare them, and whether you would dispense them:

1.

R—Quiniæ Sulph., . . . gr. xx
 Acid Sulph. Dilut., . . . f $\overline{3}$ ii
 Ext. Glycyrrh. Fld., . . . f $\overline{3}$ i
 Aquæ, q. s. ut. ft. . . . f $\overline{3}$ ii

Sig:—A teaspoonful every two hours.

3.

R—Acid. Arsenios., . . . gr. iii
 Pulv. Opil., . . . gr iv
 Extract. Gentian., . . . $\overline{3}$ i
 Misce, et fiat massa in pil. no. xx dividenda.
 Sig:—One to be taken three times a day.

2.

R—Hydrarg. Chlorid. Mit., . . . gr. ii
 Antim. et Pot. Tart., . . . gr. ss
 Pulv. Ipecac. Comp., . . . $\overline{3}$ ss
 Tinct. Aconiti Rad., . . . gtt. xxiv
 Tinct. Verat. Virid., . . . gtt. xxiv
 Sacch. Alb., . . . $\overline{3}$ i

Fiat pulvis, in chart. xii dividend.

Sig:—One to be taken every three hours.

4.

R—Potass. Chlorat., . . . $\overline{3}$ iii
 Acid. Nitromuriatic., . . . f $\overline{3}$ i
 Syrup., . . . f $\overline{3}$ ii
 Aquæ, . . . f $\overline{3}$ iii

Misce.

Sig:—A dessertspoonful to be taken in water every four hours.

K.

5.
R—Tinct. Cannabis. Ind., . . . f $\overline{5}$ v
Aque Menth. Pip., . . . f $\overline{5}$ ii
Ft. mist.
Sig:—A teaspoonful to be given three times a day.

7. OLEAGINOUS MIXTURE.

R—Olei Tigllii, f $\overline{3}$ ii
Tinct. Opil, m xv
Pulv. Acaciae, aa $\overline{3}$ ii
Sacchari, aa $\overline{3}$ ii
Aq Menth. Virid., f $\overline{3}$ ii
Ft. mist. sec. art.
Sig:—Shake the mixture, and take a tablespoonful every two hours till it operates.

The following is the list of specimens selected for recognition :

MATERIA MEDICA.	PHARMACY.	CHEMISTRY.	EXAMINING COMMITTEE.
Taraxacum,	Aqua creasoti,	Ammonii chloridum purif.,	Cetraria,
Filix mas,	Infusum Pruni Virginianæ,	Potassii bichromas,	Canella,
Podophyllum,	Tinctura Myrrhæ,	Magnesii sulphas,	Arnica,
Serpentaria,	Syrupus sarsaparillæ compes.,	Zinci sulphas,	Anisum,
Uva ursi,	Extractum Taraxaci fluidum,	Ferri phosphas,	Cubeba,
Carum,	Linimentum saponis,	Plumbi acetas,	Resina,
Juniperus,	Spiritus ætheris compositus,	Atimonii sulphuretum,	Aqua Camphoræ,
Nux vomica,	Glycerina,	Alcohol amylicum,	Spir. Lavandulæ comp.
Lycopodium,	Pulvis Rhei compositus,	Acidum aceticum,	Ext. glycyrrhizæ fluid.
Mastiche.	Acidum benzoicum.	Acidum gallicum.	Cupri sulphas.

The practical examination consisted in the spreading of a blistering plaster, and in the preparation of a copaiba emulsion, of powders composed of zinc sulphate and lead acetate, and of suppositories containing extract of opium and of belladonna.

The following candidates passed the examination and were recommended for the degree of Graduate in Pharmacy :

JOHN FREDERICK OSCAR AGTHE, North Carolina, *Preparation of Phosphorus Pills.*
CHARLES HAMILTON BALLANTINE, Pennsylvania, *Unguentum Hydrargyri Nitratis.*
RICHARD CALCOTT BARRINGTON, New Jersey, *Phosphorus.*
FENWICK HAZLETON BASSETT, New Jersey, *Lactic Acid and its Compounds.*
CHARLES BEALE, Pennsylvania, *Chloroform.*
ALLEN LESLIE BELLEVILLE, Delaware, *Salicylic Acid.*
ALEXANDER ELWELL BENNETT, New Jersey, *Glycerin.*
GEORGE MAHLON BERINGER, Pennsylvania, *Caffeina.*
EDWIN HUGH BIDWELL, New Jersey, *The Halogens.*
EDWARD GEORGE BOYSEN, New York, *Emulsions.*
LEWIS COLLOREDO BOYSEN, New York, *The Miseries in Pharmacy.*
MITCHELL BAXTER BROOKS, Pennsylvania, *Plasma, its Pharmaceutical Value.*
EDWIN RAUGHLEY BURDICK, Delaware, *Absence of Tannic Acid in Living Plants.*
CHARLES BLAIR CARL, Pennsylvania, *Tincture of Kino.*
WILLIAM HENRY CARSLAKE, New Jersey, *Cerasus Serotina.*
HARRY SCOTT CLARK, Pennsylvania, *Pharmacist's Study of Vegetation.*
LEWIS CLAY COLLIER, Ohio, *Prinos Verticillatus.*
THOMAS S. COLLINS, New Jersey, *Chenopodium Anthelminticum.*
GEORGE HAVENS COLTON, Massachusetts, *Xanthoxylum Carolinianum.*
GEORGE EMIL DAHIS, Pennsylvania, *Pills and Fill Coatings.*
ADAM CLARION DANIELS, Pennsylvania, *Glycerin.*
AUGUST JACOB DETZER, Indiana, *Chemical Affinity in Compounding Medicine.*
WILLIAM CROSSETT DOCKSTADER, Delaware, *Anamirta Cocculus.*

6.

Write out a prescription containing at least three ingredients, using their official titles in full.

8.

Write out a direction for preparing this Prescription. When prepared, would you dispense it?

R—Acid. Arsenios., . . . gr. xvi
Potassii Bicarb., . . . gr. xvi
Spir. Lavand. Comp., . . . f $\overline{3}$ i
Aque Destillatæ, . . . f $\overline{3}$ iv

Liqua sec. art.

Sig:—A teaspoonful to be taken three times a day.

- FRANK FREDERICK DRUEDING, Germany, *Syrupus Ferri Iodidi*.
 CHARLES WILLIAM ELKINS, Pennsylvania, *Aralia Spinosa*.
 GEORGE BRYAN EVANS, Pennsylvania, *Physostigma*.
 PARKER HOOVEN FAMOUS, Pennsylvania, *Euonymus Atropurpureus*.
 GEORGE ADAM FERDINAND, Iowa, *Citric Acid in Cranberry*.
 GEORGE WASHINGTON FISHER, Pennsylvania, *Syrupus Ferri Iodidi*.
 OLIVER JOHN FREEMAN, Pennsylvania, *Zinc*.
 FRANK FRISBY, Kansas, *Fucus Vesiculosus*.
 GUSTAV ADOLPH FRUH, Pennsylvania, *Oil of Wintergreen*.
 DANIEL JOSHUA FRY, New Jersey, *Olibanum*.
 SAMUEL WESLEY GADD, England, *Syrups and their Preparation*.
 THOMAS MULLIN GALBREATH, Maryland, *Emulsions*.
 SAMUEL FRANKLIN GARMAN, Pennsylvania, *Powdered Chinoidin*.
 ROBERT GIBSON, JR., W. Virginia, *Cornus Circinata*.
 JAMES ALEXANDER DAVIS HALLOWELL, California, *Fermentation*.
 FRANK SCOTT HARKER, Pennsylvania, *Aque Purificatio*.
 FRANCIS E. HARRISON, Pennsylvania, *Improved Lozenge Apparatus*.
 ALFRED KERR HARTZELL, Pennsylvania, *Helianthemum Canadense*.
 CONRAD GABRIEL HOELL, New Jersey, *Cerates and Ointments*.
 JOHN WILSON HOFFA, Pennsylvania, *Commercial Extract Krameria*.
 LOUIS HENRY HOLDEN, Pennsylvania, *Aralia Spinosa*.
 WILLIAM C. HOLZHAUER, Wisconsin, *Eriodictyon Californicum*.
 GEORGE HENRY JACKSON, Pennsylvania, *Fermentation*.
 WILLIAM OSCAR JACOBY, Pennsylvania, *Eupatorin*.
 WASHINGTON WILLIAM JOST, Pennsylvania, *Polygala Senega*.
 JAMES PECOR KERN, Pennsylvania, *Eupatorium Perfoliatum*.
 STIRLING KERR, JR., Pennsylvania, *Pharmaceutical Manipulation*.
 THOMAS FRANKLIN KEYS, Pennsylvania, *Failure of Medicinal Substances*.
 WILLIAM JOHN KILLINGBECK, New Jersey, *Gum Arabic*.
 JOHN KLEMET, Pennsylvania, *Preservation of Drugs*.
 JOHN WILLIAM KOHLERMAN, Delaware, *Fluid Extracts*.
 WILLIAM HENRY LANTZ, Pennsylvania, *Aralia Nudicaulis*.
 GEORGE LATIN, Ohio, *Eupatorium Perfoliatum*.
 ISAAC LAVENSON, Pennsylvania, *Roots and Rhizomes*.
 ARTHUR EVERETT LEWIS, Pennsylvania, *Meconic Acid*.
 FREDERICK LOOS, JR., Pennsylvania, *Glycerole of Cinchona*.
 AMANDUS JULIUS LUTHE, Wisconsin, *Empiricism*.
 JOHN EDWARD MCCAMBRIDGE, Pennsylvania, *Hydrargyri Iodidum Viride*.
 ANDREW JAMES MCFEETERS, Pennsylvania, *Resina Podophylli*.
 JOSEPH SUMMERFIELD MADISON, Pennsylvania, *Aristolochia Serpentina*.
 JOHN MAIER, Pennsylvania, *Eupatorium Perfoliatum*.
 ALFRED STANGER MARSHALL, New Jersey, *American Druggists*.
 ARTHUR ROBINSON MILBY, Delaware, *Glass*.
 WILLIAM LELAND MILLER, Mississippi, *Value of the Laboratory*.
 WILLIAM MOSES MILLER, New Jersey, *Eriodictyon Glutinosum*.
 BERNARD JAMES MURRAY, Pennsylvania, *Rubus*.
 GEORGE HENRY OCHSE, Pennsylvania, *Liquor Ferri Acetici Ph. Ger.*
 ANDREW ALLISON O'DANIEL, Pennsylvania, *Elegant Pharmacy*.
 THOMAS EDWIN OGRAM, Pennsylvania, *Chrysophanic Acid*.
 WILLIAM MAXWELL OPDYCKE, Pennsylvania, *The Apothecary*.
 HORACE HILDEBRAND OWEN, Pennsylvania, *Terebinthina*.
 ORIC HENRY PAXSON, JR., Pennsylvania, *Aralia spinosa*.
 WILLIAM JOSEPH PECHIN, Pennsylvania, *Pinus Palustris*.
 NATHAN PENNYPACKER, Pennsylvania, *Salix Alba*.
 HENRY EUGENE PETERS, Pennsylvania, *Eriodictyon Californicum*.
 LOUIS CLARK PETTIT, Ohio, *Eugenic Acid*.
 LINNÆUS S. POLEY, Pennsylvania, *Xanthoxylum Fraxineum*.
 JOHN BREWSTER REYNOLDS, Pennsylvania, *Tinctura Opii Deodorata*.

CHARLES HAINES ROBERTS, New Jersey, *Botany*.
 EDWARD MANNING ROCHE, JR., Pennsylvania, *Jaborandi*.
 GEORGE REDSECKER ROSS, Pennsylvania, *Sanguinaria Canadensis*.
 CHARLES WILLIAM SAALFRANK, Pennsylvania, *Syrupus Rad. Glycyrrhizæ*.
 HARRY SCHANDEIN, Pennsylvania, *Unguentum Benzoini*.
 GEORGE WILLIAM SCHIMMINGER, Pennsylvania, *Comptonia Asplenifolia*.
 JACOB SHELLY, Pennsylvania, *Fluid Extracts*.
 HARRY HUBER SHERK, Pennsylvania, *Polygonum Hydropiper*.
 WILLIAM HUNTLEY SHORT, Pennsylvania, *Liquor Magnesii Citratis*.
 SILAS HENRY SHULL, Ohio, *Pharmacists and Physicians*.
 CHARLES EDWARD SLOUGH, Pennsylvania, *Pharmacal Botany*.
 HARRY LEEDOM SMEDLFY, Pennsylvania, *Asclepias Syriaca*.
 GEORGE FARRAR SMITH, JR., Tennessee, *Ointments*.
 WILLIAM HARROLD SMITH, JR., Pennsylvania, *Glycerin*.
 JOHN EDWARD SOMBART, Missouri, *Suppositories*.
 LOUIS JOSEPH STELTZER, Pennsylvania, *Castanea*.
 CHARLES PETTIT STOUT, New Jersey, *Spigelia Marilandica*.
 SAMUEL WILLIAM STRUNK, Pennsylvania, *The Metric System*.
 STEPHEN LIVERSIDGE TALBOT, Massachusetts, *Equivalence of Drops*.
 WILLIAM JAMES THORNLEY, Pennsylvania, *Oenothera Biennis*.
 JOSEPH ALEXANDER TITCOMB, Tennessee, *Pills*.
 WILLIAM GEORGE TOPLIS, Pennsylvania, *Gelatin Lozenges*.
 HERMAN VAN ALLEN, Wisconsin, *Fiburnum Prunifolium*.
 WILLIAM SAMPSON WALLACE, Ohio, *Falsifications*.
 FRANK STEPHEN WARNER, Ohio, *Digitalis*.
 EDWARD WARRINGTON, New Jersey, *Cosmolin and Vaseline*.
 GEORGE C. WEBSTER, Pennsylvania, *Aristolochia Serpentaria*.
 JAMES ADDISON WHITE, Ohio, *Hydrastis*.
 GEORGE ELI WILLIAMS, New York, *Absorption of Moisture*.
 GEORGE BYRON WINEBRENNER, Maryland, *Coccus Cacti*.
 PRESTON REUBEN YOUNG, Pennsylvania, *Adulteration of Beer*.
 CHARLES FREDERICK ZELLER, Pennsylvania, *Thalleioquin Test*.
 MASON WOOWARD ZIMMERMAN, Pennsylvania, *Glycyrrhiza Glabra*.

The graduating class and the members of the Board of Trustees accepted an invitation tendered by the faculty for a reception at the College hall, on the evening of March 15th. A pleasant evening was spent, enlivened after supper by toasts, speeches and songs.

The commencement was held at the Academy of Music on the evening of March 16. The degree of Ph.G. was conferred by the President of the College, Dillwyn Parrish. The Procter medal, which is awarded to the student presenting a meritorious thesis, attaining the highest general average at the examination, and receiving the mark *very satisfactory* in each branch, was presented by Prof. Remington to Geo. H. Colton, of Springfield, Mass. Honorable mention was made of the following graduates whose general average at the examination was *very satisfactory*: G. M. Beringer, L. C. Collier, D. Fry, Jr., T. M. Galbreath, R. Gibson, Jr., F. S. Har-ker, C. G. Hoell, J. W. Hoffa, G. H. Ochse, H. C. Peters, J. E. Sombart, C. P. Stout, S. W. Strunk, S. L. Talbot, C. F. Zeller and M. W. Zimmerman.

Prof. Sadtler presented the prize of \$100 offered by Henry C. Lea, Esq., for the best thesis, to Stephen L. Talbot, of Boston, Mass. The thesis of the following gentlemen were deemed worthy of honorable mention: G. H. Colton, L. C. Col-lier, G. A. Ferdinand, F. Frisby, R. Gibson, Jr., F. E. Harrison, J. W. Hoffa, L. H. Holden, W. C. Holzhauer, G. Latin, J. E. McCambridge, L. C. Pettit, L. J. Steltzer, H. Van Allen and C. F. Zeller.

The valedictory address was delivered by Prof. Maisch. At the close of the address Prof. Sadtler was surprised with a handsome silver tea set, presented to him by Thos. L. Collins on behalf of the class. As usual the exercises, which had attracted an unusually large audience, were interspersed with music and closed with the distribution of bouquets, books and other presents sent upon the stage by the friends of the graduates.

The Alumni Association of the Philadelphia College of Pharmacy gave its annual reception to the graduating class on the afternoon of March 15. After some introductory remarks by the President, W. E. Krewson, the recent graduates were admitted to membership, and the alumni gold medal was presented to G. H. Colton. The annual address was delivered by Jos. L. Lemberger, of Lebanon, Pa., of the class 1854, and was well received. The graduates having passed the best examination in the different branches were presented with alumni certificates, namely: R. Gibson, Jr., *Materia Medica*; S. W. Gadd, *Pharmacy*; C. G. Hoell, *Chemistry*; J. E. Sombart, *General pharmacy*, and Geo. Latin, *Pharmaceutical manipulation*. The spokesman of the graduating class was G. A. Ferdinand, whose valedictory address was very creditably delivered. The certificate for having attained the highest mark in the junior examination was awarded to Geo. Goebel, and after announcing the names of both the senior and junior students, who, in the recent examinations, received the general average *very satisfactory*, the audience dispersed.

The Essex County, Mass., Pharmaceutical Association met in Plummer hall, Salem, Wednesday forenoon, February 18, at 10 o'clock. About 30 members were present when President Frothingham, of Haverhill, called the meeting to order. He spoke briefly, urging an increased effort to bring into the organization all the druggists of the county. He also urged that some action be taken to secure the repeal of the stamp-tax on many articles sold by the pharmacists. The president and secretary were constituted a committee to prepare a memorial to Congress, urging the repeal of this tax. Mr. Whitney, of Lawrence, read a valuable paper on ointments. Mr. S. A. D. Sheppard, of Boston, delivered an address on the history and objects of pharmaceutical associations. He thought that the pharmacists should give up the traffic in cigars, soaps and the like, cease to be merchants and become what they were by right, members of a profession. A discussion followed on the metric system, after which the members adjourned to the Essex House to dinner.

The entire company, after dinner, paid a visit to the "Marine Museum," and investigated all the attractions which their limited time allowed. The "first church," which was built in 1627, was among the objects of interest visited.

New York College of Pharmacy.—At the Commencement held at Chickering Hall, on the evening of March 16th, the following gentlemen received the degree of Graduate in Pharmacy:

John Albert, Jr., New York, *Percolation*.
Emilio Bergara, Trinidad, Cuba, *Salicylic Acid*.
J. A. Biskey, New York, *Water*.
W. P. Blair, Columbus, Miss., *Fermentation*.
Herman Breiting, Germany, *Phosphorus and Acid*.

- J. C. Comstock, Windsor, N. Y., *From Seed to Seed*.
 J. Dahlbender, Mainz, Germany, *Mercury*.
 Eugene W. Denton, New York, *Osmose*.
 W. S. Disbrow, Newark, N. J., *Copper*.
 Ch. H. Duffy, England, *Antimony*.
 Joseph Feil, Cleveland, O., *Podophyllin*.
 W. Frank Fiero, New York, *Glycerin*.
 H. F. Frank, Rahway, N. J., *Digitalis*.
 Fr. Aug. Grenzabach, Peekskill, N. Y., *Glycerin*.
 Joseph A. Herb, New York, *Cathartics*.
 Ferd. Julius, New York, *Campbor and Preparations*.
 A. A. Kirschner, New York, *Chloride of Sodium*.
 Otto Klinkenberg, Jonesville, Ind., *Volatile Oils*.
 Alvin Geo. Koehler, Brooklyn, N. Y., *Iodine*.
 A. Th. Koertge, New York, *Opium*.
 Hy. M. Kolasky, Augusta, Ga., *Lead Plaster and Compounds*.
 George Kraft, Jr., Newburgh, N. Y., *Essential Oils*.
 Salvador J. Lahey, Ireland, *Belladonna*.
 Albert H. Lins, Mount Vernon, N. Y., *Acetic Acid*.
 B. H. Livingston, Brooklyn, N. Y., *Benzoin*.
 Albert A. Merritt, Pawling, N. J., *Xanthoxylum*.
 Charles Meyer, New York, *Opium*.
 Frank L. Morris, Newark, N. J., *Iron*.
 Frank Nadler, Peru, Ills., *Valerianic Acid*.
 Samuel Nauheim, London, Eng., *Zinc*.
 J. J. R. Paulsen, New York, *Digitalis*.
 J. A. Proben, Hessen, Germany, *Copper*.
 Ph. Scheu, New York, *Paraffin*.
 H. C. Schmidt, Hoboken, N. J., *Digitalis*.
 Ch. J. Schneider, Germany, *Vaporization and Condensation*.
 F. T. Schultze, New York, *Pepsin*.
 Oscar W. Stiebeling, New York, *Arsenic*.
 F. G. E., Strahlemann, Oldenburg, Germany, *Volatile Oils*.
 W., Tack, New York, *Seidlitz Powder*.
 Hy. C. Thomm, Oswego, N. Y., *Cork*.
 G. A. Van Deinse, Holland, *Hydrargyrum*.
 John A. Whittet, New York, *Jaborandi*.
 Max Wustrow, New York, *Stramonium*.
 H. S. Zeuschner, New York, *Belladonna*.

Of this class, we have been informed, the highest average was obtained by Joseph Feil. At the junior examination, which was held this year for the first time, ninety-one students were successful, the class being headed by René Ravenel Snowden.

Maryland College of Pharmacy.—The 28th Annual Commencement exercises took place at the Academy of Music on the evening of March 22, when the degree of Ph.G. was conferred by the President, Joseph Roberts, upon the following gentlemen:

- Joseph Ayd, Maryland, *Distillation*.
 Royal H. Bussler, Pennsylvania, *Pharmacy*.
 Ernest F. Hein, Germany, *Sulphur*.
 John Herr, Maryland, *Physostigma*.
 John H. Frames, Maryland, *Antimony*.
 Chas. H. Lee, Louisiana, *Syrup of Iodide of Iron*.
 Zebulon Lowe, Maryland, *Petroleum*.
 A. B. Reese, Virginia, *Emulsions*.

Chas. Schmidt, Maryland, *Carbon*.
Frank E. Stough, Ohio, *Podophyllin*.
Wm. F. Thiede, Jr., Maryland, *Iodine*.
M. J. Wolf, Maryland, *Belladonna*.
Gustav Woltereck, Germany, *Bromine*.

The following prizes from the College to the Graduating Class were presented by Dr. Roberts: The gold medal to Charles Schmidt, the second prize, consisting of copies of "Fresenius' Chemistry," "Wöhler's Organic Chemistry" and "Armstrong's Organic Chemistry," to Chas. Hill Lee, and the third prize, consisting of copies of the "National Dispensatory" and the "German Pharmacopœia," to Ernest F. Hein.

The recipient of the College prize to the Junior Class, consisting of "Shakespeare's Complete Works," was William Caspari, Jr. The gold medal from the Alumni Society was presented by Prof. Simon to Charles Hill Lee.

The following Junior Class students are entitled to honorable mention: Wm. Caspari, Jr. (Prize), R. P. C. Scheidt, E. H. Kabernagle, A. H. Shultze, Cameron Piggot, Hammond Mason, Clarence F. Moore and R. S. McKinney.

The valedictory address was delivered by Rev. Julius E. Grammer, D.D. The exercises were enlivened by choice music and a number of floral and other gifts were presented by the friends of the graduates.

Pittsburgh College of Pharmacy.—The first graduating class of this institution received their diplomas on the evening of March 11, the commencement exercises being held at Lafayette Hall. The degree of Graduate in Pharmacy was conferred by the President, Geo. A. Kelly, upon the following gentlemen:

George Fry (*Syr. Glycyrrhizæ*), Charles L. Kuhn (*Evaporation*), Adolph Henry Kraeling (*Pill Excipients*), James Macbeth Little (*Syr. Phosphates Comp.*), Samuel McElroy, Jr. (*Pharmacy Laws*), James Clancy McElroy (*Calisaya Bark*), James Sansom McBride (*Eucalyptus Globulus*), A. C. Robertson (*Berberis Aquifolium*), Oliver C. Sarver (*Pharmaceutical Cleanliness*), David Franklin Sawhill (*Emulsions*), John Wurzell (*Pure Sulphate of Copper*).

Mr. W. D. Moore addressed the audience, dwelling mainly on some abuses which are sometimes practised under the cover of pharmacy. The valedictory address on behalf of the class was delivered by J. C. McElroy, and on behalf of the Faculty by Prof. W. G. Reiter, M D.

Louisville College of Pharmacy.—The commencement exercises were held at the Hall of the College, on Green street near First, Monday, March 15. The valedictory address, delivered by Prof. C. L. Diehl, was full of sound advice. The degree of Graduate in Pharmacy was then conferred upon two gentlemen, Messrs. Wagner and Mehringer, and the following gentlemen, Messrs Stahl, Shelly, Buschemeier, Seiler, Johanboecke, Struby, having successfully passed the junior examination, were granted certificates to that effect.

Mr. Jacob Flexner, on behalf of the Alumni of the College, then presented the prizes offered by that association, consisting of a gold medal to the graduate having the highest average (Mr. Wagner), and of a copy of "Pharmacographia" to the senior student (Mr. Stahl) passing the best examination, and delivered an address appropriate to the occasion.

Cincinnati College of Pharmacy.—The Commencement exercises closing the ninth session of this college were held March 16th, at Melodeon Hall, when the degree of Graduate in Pharmacy was conferred by the President of the college upon the following gentlemen:

Julius Eichberg, Petersburg, Va., *Hard and Soft Water*.
 John Fabing, Cincinnati, *Analysis of Conchelaqua, or Quinine Plant*.
 Francis Grieme, Cincinnati, *Alstonia Constricta*.
 Rob. Groenland, Cincinnati, *Commercial Carbonate of Soda*.
 G. A. Hans, Cincinnati, *Hydrastis Canadensis*.
 Arthur Heinemann, Cincinnati, *The Mexican Vine*.
 E. F. Hallenbeck, Cincinnati, *Collinsonia Canad.*
 John W. Honaker, Owinsville, Ky., *An Examination of the Root of Helleborus*.
 Jacob W. Jones, Cincinnati, O., *Emulsions*.
 Chas. R. Judge, Cincinnati, O., *Dialyzed Iron*.
 F. E. Kline, Cincinnati, O., *Ailanthus Glandulosa*.
 J. M. Long, Cincinnati, O., *Soaps of Pharmacy*.
 Chas. C. Reakirt, Jr., Cincinnati, O., *Suppositories of the U. S. P.*
 Henry I. Schulte, Cincinnati, O., *Cascara Sagrada*.
 Edward Speidel, Cincinnati, O., *Ferro-phosphated Elixir Calisaya Bark*.
 H. G. Westphal, Germany, *Benzoate Sodium*.
 Otto S. Weusthoff, Dayton, O., *Robinia Pseudacacia (common Locust)*.

The exercises were enlivened by music, and addresses were delivered on behalf of the faculty by Prof. E. S. Wayne, and on behalf of the Board of Trustees by Thad. Reamy, M.D.

The professors' prizes, consisting of gold medals, were awarded to Jul. Eichberg (Chemistry), Otto S. Weusthoff (Materia Medica and Botany), Charles R. Judge (Pharmacy), and the Alumni gold medal, for the best general examination, to Julius Eichberg.

St. Louis College of Pharmacy.—The Fourteenth Annual Commencement exercises were celebrated Tuesday evening, March 16th, 1880, at Germania Hall. The President, Mr. George Ude, addressed the select and numerous audience in a few well-chosen remarks, and handed to each graduate the diploma of the college conferring the degree of "Ph.G." Their names are: Messrs. E. G. Bauer, V. E. Eilbracht, Zeno Felder, Julius Feickert, S. F. Flint, F. A. Graichen, E. T. Green, Erwin Grimm, A. Hamel, H. Hoyer, John P. Huhn, L. Kempf, Theo. Klipstein, Thomas Knoebel, A. A. Krusskopf, F. T. McAuliffe, A. Pohrer, A. Rohlfing, Benjamin Saenger, Emil A. Sennwald, H. Stubbemann, A. Temm, A. Troxell, Chr. Van Zandt, F. Vedda and A. Wellmeyer. The silver medal of the Alumni Association, to be awarded to the graduate who attained the highest average in all the branches taught, was presented by Prof. J. M. Good to Mr. Emil A. Sennwald. The following received honorable mention: Messrs. A. A. Krusskopf, Theo. Klipstein and Thomas Knoebel. The valedictory address, delivered by Prof. Chas. O. Curtman, was a masterly effort. The valedictory address in behalf of the class was delivered by Mr. S. F. Flint.

The addresses were interspersed with choice pieces of music. After the numerous bouquets and other floral offerings had been distributed, the balance of the evening was spent in a social reunion, the devotees of Terpsichore enjoying themselves until the wee small hours.

EDITORIAL DEPARTMENT.

The Diploma Swindle.—It was recently reported to a committee of the Massachusetts Legislature, that the Massachusetts Medical Society had proof positive of the following so-called colleges and universities, selling their diplomas without any evidence of study or fitness: American University of Medicine and Surgery, of Philadelphia; Philadelphia University of Medicine and Surgery; Physio-Eclectic Medical College, of Cincinnati, O.; Physio-Medical College (new issue), of Cincinnati; American Eclectic Medical College, of Cincinnati; St. Louis Homœopathic Medical College; St. Louis Eclectic Medical College; New England University of Medicine and Surgery, of Manchester, N. H.; University of Medicine and Surgery, of Haddonfield, N. J.; and American Vitopathic College, of Cincinnati, O.

Whether the list is complete, we do not know; but we remember that the names of the notorious Dr. John Buchanan and Wm. Paine were connected also with other concerns besides the first two mentioned above. Although the charters of these Philadelphia institutions (?) were repealed by the legislature for gross fraud, the business of diploma selling continued to flourish, until on February 28th last two reporters of the Philadelphia "Record" exposed the traffic, having obtained for the sum of \$25 from the dean of the so-called Philadelphia University, Rev. T. B. Miller, a certificate that they were entitled to practice medicine, and the promise of a diploma for an additional consideration. Two other ministers, Revs. Ingraham and W. Major, figured, the former as president, the latter as secretary of the institution. On March 18th Miller was expelled from the membership and ministry of the church to which he belonged, and Major was suspended from the ministry for one year.

It seems almost as if the law was powerless to reach such offenders. Years ago the attorney-general was officially requested to proceed against the fraudulent concerns. Notwithstanding this, they have not been molested, and it may be assumed that, although the shop has been closed for the present, the same institutions (?), perhaps under different officers, will again take up the old business as long as there is any money in it.

The Percentage Business and Cipher Prescriptions in California.—A bill has been introduced by Mr. Braunhart into the legislature of California making it a misdemeanor, punishable by a fine of from \$50 to \$500, for any apothecary and physician to pay or receive any money or property as a commission or reward for prescriptions. At a meeting of the California Pharmaceutical Society this bill was endorsed, and amendments were proposed making it a misdemeanor, punishable by a fine of \$50, for a physician refusing, upon the application of a competent pharmacist, to give the proper name or formula for any article or preparation of medicine which he may have prescribed by arbitrary signs, names or numbers, and for a pharmacist refusing in like manner, if he has knowledge of the proper name or formula.

Every reputable physician and pharmacist will acknowledge that there is nothing in this law but what is required by the codes of ethics of the medical and pharmaceutical societies; yet the "Western Lancet" opposes the measure, as we learn from a pamphlet by Prof. Emlen Painter, of the California College of Pharmacy. To what extent the discreditable practise is carried on will be seen from the following extracts from Prof. Painter's reply:

"At this very moment, in summing up, and without any references, I can call to mind as many as twenty physicians who are in the habit of writing cipher prescriptions, several of whom are classed among the leading physicians of the city, and who write by far the largest number of prescriptions of any practising here. If we may judge from such prescriptions as fall into the hands of druggists who are not in collusion with such physicians, at least 90 per cent. of them are written in that unprofessional manner. Some of these doctors, occupying public positions of honor and trust, some occupying professorships in our medical schools—especially in the medical department of the University of California—are, I am grieved to say, included in that category, and their influence is felt to such an extent that not a few of the young graduates seem to think that being paid a percentage on their prescriptions is a legitimate business transaction.

"And some professors, too, are in the habit of not only writing in cipher, but also of giving the prescription to the patient in a sealed envelope, with the printed address of a certain druggist upon it. It would appear that moral suasion is not sufficient in the other five cases out of the ten. Perhaps the fears that the patient might discover the important fact that he could get the same medicine at any other store for one-third of the price, impels these vampires to adopt this sealed envelope and the secret cipher plan."

The resolutions approving of the bill have been signed by 94 out of the 98 apothecaries of San Francisco, and it is to be hoped that a large proportion of the medical profession will likewise favor a measure for the suppression of the dishonorable collusion, having for its purpose the fleecing of the sick.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

Lehrbuch der Pharmaceutischen Chemie. Von Dr. Hugo Schwanert, ordentl. Professor der Chemie an der Universität zu Greifswald. In drei Bänden. Erster Band. Mit 146 Holzschnitt-Illustrationen und einer Spectraltafel. Braunschweig: C. A. Schwetschke und Sohn. 1880. 8vo, pp. 756.

Pharmaceutical Chemistry, in three volumes. Vol. I, with 146 wood-cuts and a spectral chart.

A work on chemistry, intended for the special use of pharmacists, may be written from different stand-points and with different objects in view. Aside from such, which merely aim at teaching the most approved methods of manufacturing the various definite compounds employed in medicine, it may assume a certain knowledge of physical and chemical laws, and thus adapt itself to the wants of the more advanced student; or, it may endeavor at teaching chemistry to the novice who has yet to master those laws upon a knowledge of which the correct understanding of processes and reactions depends. A full and accurate knowledge of the pharmaceutical chemicals can doubtless be obtained only through an insight into the more important physical laws and into the importance of physical and chemical properties, and through a familiarity with the fundamental chemical laws, and with the production, constitution and behavior of elements and compounds, including such, which though not medicinally employed, are of importance on account of analogy, or because of being utilized in the preparation of medicinal chemicals. It is obvious, therefore, that among the material of a work on pharmaceutical chemistry many bodies may be omitted which for the theoretical chemist are of importance,

while, on the other hand, compounds possessing little theoretical interest, but interesting and important on account of their practical application in medicine, should be treated more in detail than is usually done in works on theoretical chemistry.

The work, the first volume of which is now before us, aims to develop the recognized theories and the accumulated facts of chemistry in its special application to pharmacy and medicinal compounds; and this object is continually kept in view by the author, who was formerly a practical pharmacist, and occupies a prominent position as teacher of chemistry.

The introductory chapter of the work defines the domain of pharmaceutical chemistry and the fundamental theories of natural philosophy, which are further developed in the chapter on the physical properties of bodies, embracing crystallography, alteration by temperature, latent and specific heat, absolute and specific gravity, influence of light, electricity and galvanism. The next chapter treats of the chemical properties of bodies, explaining the nature of elements, chemical compounds, equivalents, atoms, molecules, symbols, chemical equations and stoichiometric calculations, quantivalence, formulas, isomerism, metamerism, polymerism, chemical constitution, nomenclature and electrolysis.

After these general considerations, which occupy one-fourth of the present volume, the author proceeds to the description of the various elements and their compounds, reserving what is known as organic chemistry for a separate volume. The arrangement of the elements by the author is based in the first place upon the electrochemical affinities of hydrogen and oxygen, with which two all other elements may be arranged in two series; considering, at the same time, the quantivalence of the elements, they are placed into well-known natural and simple groups. But while these are generally recognized, the majority of chemical text-books depart in their arrangement from these groups, to which the author adheres, securing thereby the consecutive consideration of those elements most nearly related. While pointing out the fact that the definition of *metal* is based upon purely physical properties, the division into non-metallic and metallic elements is adhered to because convenient, and the members of the former division are treated of in this volume in the following order: Hydrogen, chlorine, iodine, bromine, fluorine, oxygen, sulphur, selenium, tellurium, nitrogen, phosphorus, arsenic, antimony, boron, silicon and carbon.

Throughout the book the familiarity of the author with the wants of the pharmacist is evident, the definitions and descriptions are clear and to the point, and there is a detail of matter which renders the book a most acceptable one as a text-book for the pharmaceutical student and as a work of reference for the practical pharmacist. Although there is no lack in the English language of good works on systematic chemistry, we are not acquainted with one of similar scope and usefulness in the special branch to which it is devoted. It is to be hoped that the remaining two volumes are sufficiently far advanced to secure their early publication.

Report on the Revision of the U. S. Pharmacopœia Preliminary to the Convention of 1880; being a rough draft of the general principles, titles and working formulæ proposed for the next pharmacopœia. Prepared and compiled by Charles Rice, chairman of the committee. New York: 1880. pp. 202.

This is the committee report which the American Pharmaceutical Association

ordered to be printed after receiving the necessary funds by subscriptions. Our readers are aware that we highly appreciate the invaluable services of the chairman, and the efficient labors of the various contributors. Notwithstanding this, we have been opposed to the publication of the report; but, although we see no reason to change our views, we sincerely trust that our misgivings may ultimately prove to have been unfounded.

Sore Throat, its Nature, Varieties and Treatment; including the connection between affections of the throat and other diseases. By Prosser James, M.D., Lecturer on Materia Medica and Therapeutics at the London Hospital, etc. Fourth edition: Philadelphia: Lindsay & Blakiston, 1880. 12mo, pp. 318. Price, \$2.

The intrinsic value of this work, and the researches of its author in the class of diseases of which the book treats are well known to our medical readers, and need no further comment. The typography is unexceptionable, the wood cuts are instructive and the copper plate engravings, colored by hand, are excellent. The present enlarged and partly rewritten edition will doubtless be hailed with the same satisfaction, by every laryngoscopist, that has been accorded to the preceding ones.

Brain Work and Over Work. By Dr. H. C. Wood, Clinical Professor of Nervous Diseases in the University of Pennsylvania, etc. Philadelphia: Presley Blakiston. 1880. 16mo, pp. 126. Price, 50 cents.

This is one of the volumes of the American Health Primers, which were formerly published by Lindsay & Blakiston. The little book before us should be in the hands of all using their mental faculties in their daily labors. It discusses all questions connected with brain work in a forcible and suggestive manner, and we feel confident that all interested in the subject will study it with profit to themselves.

Our Homes. By Henry Hartshorne, A.M., M.D., formerly Professor of Hygiene in the University of Pennsylvania. Philadelphia: Presley Blakiston. 1880. 16mo, pp. 150. Price, 50 cents.

Another volume of the American Health Primers, and one in the subject matter of which every one is interested, since it discusses the all-important question: How shall we have healthy homes? Situation, construction, light, warmth, ventilation, water supply, drainage, disinfection, population and workmen's homes are the topics considered. More than 30 wood cuts have been introduced in illustration of the correct and improper systems of ventilation and drainage.

On the Internal use of Water for the Sick, and on Thirst. A clinical lecture at the Pennsylvania Hospital, October 25, 1879. By J. Forsyth Meigs, M.D., one of the attending physicians to the hospital. Philadelphia: Lindsay & Blakiston. 1880. pp. 54. Price, 25 cents.

The pamphlet which bears on its title page, as a motto, the old English proverb: "Drinking water neither makes a man sick, nor in debt, nor his wife a widow"—discusses a subject of the utmost importance in which all are interested. Though delivered before medical students, this lecture may be read with profit by others, and more particularly by those to whom the care of sick people is intrusted.

Sulphate of Quinia. Statement of the American manufacturers regarding the repeal of the duty on the foreign article. January, 1880. pp. 12

This pamphlet, which we suppose may be obtained from any one of the four manufacturers of quinia in New York and Philadelphia, furnishes much food for thought to the advocates of the hasty and injudicious legislation by which the duty on foreign quinia was repealed.

The Poison Register and Poisons and their Antidotes. By John H. Nelson, Cleveland, Ohio.

As the title indicates, this book is intended for the registration of the sale of poisons. It is conveniently ruled so as to give the date, time, name of poison, quantity, purchaser, residence, witness, etc.; and this is preceded by an account of the various poisons, their antidotes, symptoms and tests, and by a compilation of the various State laws regulating the sale of poisons. The latter are not quite complete, several have been overlooked by the compiler, which were published in the Proceedings of the American Pharmaceutical Association since 1868. Apothecaries will find the book serviceable and well adapted for the purpose for which it is intended.

Deutsch-Amerikanische Apotheker-Zeitung (German-American Apothecaries' Gazette).

The first number of this semi-monthly paper is dated March 15, and consists, exclusive of the advertisements, of 13 large quarto pages. It is edited by Dr. Geo. W. Rachel, and published by the Pharmaceutical Publishing Company, 5 Gold street, at \$2.50 per year. It is very creditably edited, printed upon good paper and in clear type, and, to judge from the initial number, deserves the support of the pharmacists, physicians, chemists and druggists who are conversant with the German language.

Index Medicus. New York: F. Leypold.

This excellent journal has entered upon its second year, and is in reality what it professes to be, a complete classified record of the medical literature of the world. Its price is \$3 per year.

We hereby acknowledge the receipt of the following pamphlets:

The Calendar of the Pharmaceutical Society of Great Britain. 1880. pp. 456.

Valedictory Address to the Graduating Class of the Medical Department of California, by Prof. W. F. McNutt, M.D.

Microscopical Fungi Infesting our Cereals. By Wm. Barbeck. Reprint from the "American Naturalist," October, 1879.

The Sanitation of small Cities. By David Prince, M.D. From "Transactions of the Illinois State Medical Society."

Color Blindness and Defective Sight Among Railroad Employees.

The Fallacies of Popular Clinical Medicine. By Prof. Jarvis S. Wight, M.D., of Brooklyn.

The Anatomical Relations of Uterine Strictures. By T. H. Buckler, M.D., Baltimore, Md.

The New Anæsthetic, the Bromide of Ethyl. By R. J. Levis, M.D., Philadelphia.

Researches on Hearing through the Medium of the Teeth and Cranial Bones. By Chas. H. Thomas, M.D., Philadelphia.

A Plea for Cold Climates in the Treatment of Pulmonary Consumption. By Talbot Jones, M.D., St. Paul, Minn.

Therapeutic Action of Mercury. By S. V. Clevenger, M.D., Chicago.

Nitro-Glycerin as a Remedy in Angina Pectoris. By Wm. Murrell, M.D., M. R. C. P. (from the "Lancet").

Annual Review of the Drug Trade of New York, for the year 1879. By D. C. Robbins.

Sur l'usage et l'abus du Thé et du Café, suivi d'une note sur le Maté. Par Adrien Nicklès. On the use and abuse of tea and coffee, with a note on maté.

This is an interesting communication made to the society for sciences, agriculture and arts of Lower Alsace.

Réponse à une note de M. le Dr. Phipson, intitulée : On the Nascent state of Bodies.
Par le Dr. D. Tommasi.

A reprint from "Revue Hebdomadaire des Sciences."

OBITUARY.

HEINRICH AUGUST LUDWIG WIGGERS, PH.D., Professor of Pharmacy at the university of Göttingen, died in that city February 23d, in the seventy-seventh year of his age. Wiggers was born in the village of Altenhagen, June 12th, 1803, where his father labored as minister. He served his apprenticeship in pharmacy from 1817 to 1822, and in 1827 went to the university of Göttingen to complete his studies. In the following year Professor Stromeyer induced him to accept the position of assistant at the chemical laboratory, in which capacity he labored, since 1835 under Professor Wöhler, until 1850. In 1835 he received the degree of Ph.D., and in 1837 he became private lecturer on pharmacognosy, and in 1846 also on pharmacy. In 1848 he was promoted extraordinary professor, and in 1850 inspector-general of the pharmacies of Hannover in place of Professor Wöhler, whom and his predecessor Stromeyer he had assisted in these duties since 1828. He resigned his inspectorship in Hannover in 1868, but continued to act in the same capacity in the county of Lippe until disabled by sickness. In 1864 he received the title of medical councillor and in 1870 a fund was created by the pharmacists of the province of Hannover, which is known as the Wiggers fund, and used for aiding deserving pharmaceutical students at the university of Göttingen. Early in 1879 he had a severe attack of pleurisy, which developed into dropsy of the chest, the immediate cause of his death.

Wiggers made a number of important chemical investigations, chiefly during the earlier period of his connection with the university of Göttingen. His researches on ergot, pareira brava and quassia are perhaps those best known in America. Of still greater importance are the literary labors of Wiggers, which commenced with the translation from the Swedish into the German language of the last sixteen annual reports on chemistry, commenced by Berzelius and continued by Svanberg, and of Berzelius' Handbook of Chemistry in ten volumes; these translations were made under the supervision of Professor Wöhler. In 1844 he commenced the publication of the celebrated annual report on the progress of pharmacognosy and pharmacy in all countries, in which he also embodied his own observations. This report was at first issued as a part of Cannstatt's Annual Report on Medicine; but since 1866 is published as an independent work, edited since 1874 by Professor Dragendorff.

As teacher of pharmacognosy, he was indefatigable in improving the material for instruction, and acquired a collection of drugs which is regarded as one of the most complete ones in Europe. It is now in the possession of the state for the use of the university, and was used by him in writing the descriptions for his "Grundriss der Pharmacognosie" (Outlines of Pharmacognosy), of which several editions have been published.

Modest and kind in disposition, industrious and conscientious in the discharge of his duties, he was respected and beloved by his pupils, and secured the esteem of the intelligent pharmacists of all countries. By his death the American Pharmaceutical Association and the Philadelphia College of Pharmacy lost one of their most favorably known honorary members.